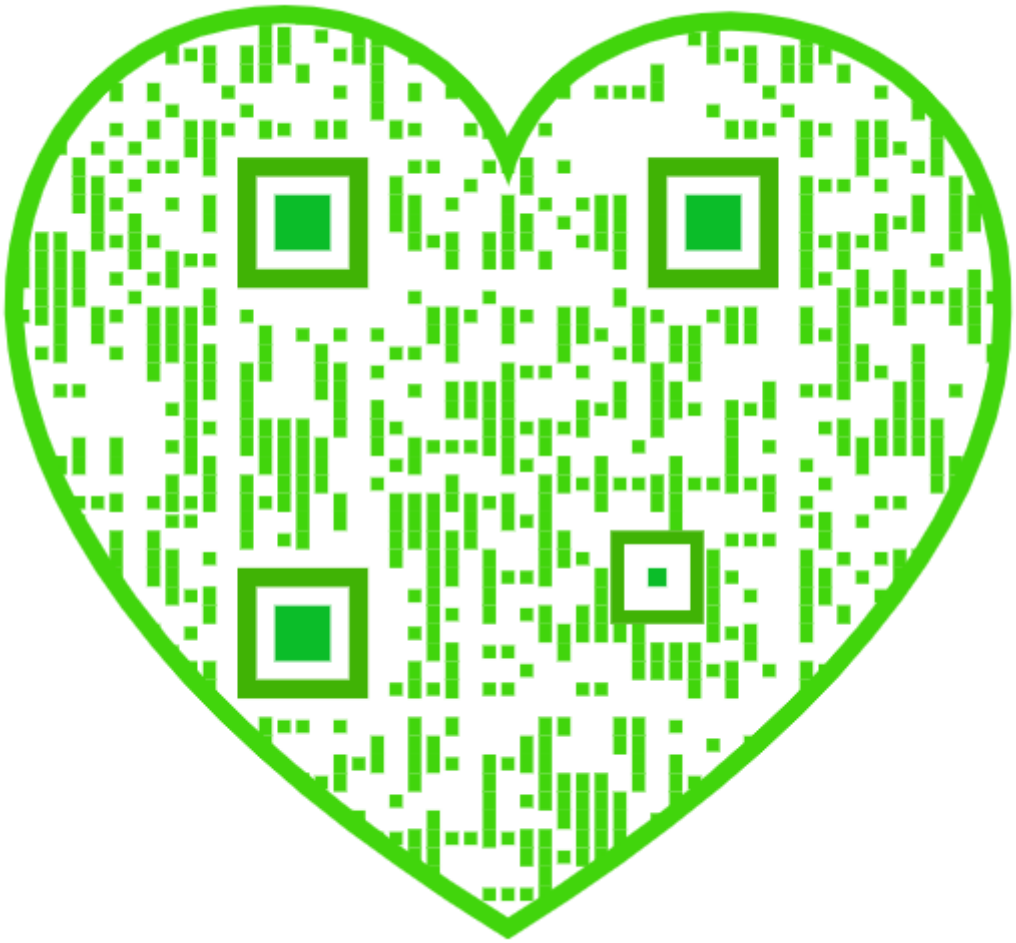
# EXTERIOR PAINTING

## WOOD, IRON & BRICK



# Exterior Painting

## A Series of Practical Treatises on

MATERIAL, TOOLS AND APPLIANCES USED; THE PAINT SHOP AND ITS ARRANGEMENT; THE PREPARING AND MIXING OF PAINT; MAKING OF TINTS; THE APPLYING OF PAINT; PAINTING AND REPAIRING WOODEN BUILDINGS; PAINTING POOR SURFACES AND OLD WOODEN BUILDINGS WHICH WERE NEVER PAINTED; THE PAINTING OF IRON BUILDINGS AND SURFACES; PAINTING GALVANIZED IRON SURFACES; THE PAINTING AND REPAINTING OF BRICK BUILDINGS AND FLATTING.

**Each Treatise is followed with Test Questions for the Student**

By F. MAIRE
Author of Modern Painters' Cyclopedia

ILLUSTRATED

CHICAGO
Frederick J. Drake & Company
PUBLISHERS

Monograph

TT320
.M3

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10-2-1769

# Exterior Painting

INTRODUCTION TO THE RED SERIES MANUALS

It is a self-evident fact easily ascertained by any one who will take the trouble to do so, that if we are to produce our own mechanics here on American soil, it must be through another process than that which has been regarded as good enough in the past—*apprenticeship.*

Our young men *will not* stand to go through the one or two years of menial drudgery usually attached to the learning of most trades, but more especially to that of painting, decorating, and paper hanging. Besides, they know full well that the master painter himself has no time to spare that he can devote to teaching them the

trade; that the foreman has possibly still less, and that the journeyman *will not,* even when qualified to do so, which is not very often the case.

Therefore, the uncertain catch-it-as-you-can mode of learning the painting and allied trades in vogue at the present time, presents no attraction to the up-to-date young man.

He knows well and fully realizes that the little that he may learn of it in a three- or four-year term of apprenticeship could very easily be obtained inside of as many months of connected study, with the consequence that he keeps away and is unwilling to bind himself to years of useless drudgery and does not learn our trade, even when his natural inclinations and tastes strongly incline him to do so if it could be made more congenial to him.

The general public is beginning to be aware of these conditions, and already a cry is beginning to be heard over the whole

country demanding that special schools of instruction be established by State and municipal aid, and already—in many of our larger cities at least—industrial and manual training schools have and are being established.

Besides these, numerous correspondence schools have also been established for the purpose of teaching trades.

While certain forms of knowledge can be obtained by the above system is no doubt true, it must be admitted that in the various trades connected with painting, decorating, or paper hanging, they have not proved of much value, as aside of the technical knowledge imparted by the textbooks used in connection with these schools, the rest must be developed at home by actual work—the distance and the very slow process of correction, and, as in painting, the impossibility of even presenting these home studies for examination and correction, renders correspondence schools

of but little practical value in the trades mentioned, aside of the possibility of sending out for correction of a few drawings or samples of letter formation, etc., which are not really actual work, as that is too bulky and the cost would be too great an undertaking for the average student—the time required to receive corrections and advice even if it were possible to send out bulky, actual work, would prove the process of learning to be so slow as to disgust the average student, and the cost attached to such methods must forever bar them from general use for trades where the students *must be shown.*

With a view or helping out all such young or even old who desire information regarding trades, this series of manuals has been gotten up.

Each one will treat upon same special or separate branch in the several trades. The student will find the subject-matter has been arranged in graded lessons as far as

possible, taking up the matter concerned at the base or root of it, gradually developing the same onward to its completion. Each manual will have a number of questions at the end of each lesson which will make them of great value to instructors who teach these trades in industrial or manual training schools and they no doubt will gladly welcome their advent.

The author himself being an instructor in such schools (The Chicago School of Painting, Decorating and Paperhanging), has almost had the publication of these manuals forced upon him, at least such as are directly in line with the branches taught in his school, as there is no literature in existence today, published in such a form as is needed and available for the purpose of teaching these trades in graded lessons with questions on same.

For the student who cannot attend these schools, it will take in a measure the place of the "correspondence schools" and at so

much less expense in dollars and cents, that he will hardly feel it.

The low prices made for such manuals of special information are made possible only by the anticipation of large sales and the whole series when completed, will not cost as much as many single books which treat the same subject matter from the standpoint of the trained mechanic and intended for such but for which the student would have little use.

The author has been careful to avoid all ambiguity in his presentation of methods and of the explanations given for doing work in these manuals; but he does not claim infallibility and no doubt some errors will find their way and escape detection in time to correct them before publication. He will take it kindly from anyone who may notice any, to have them write him of such as they may notice and if found right, the proper corrections will be made in an "errata" page, which will be inserted in sub-

sequent editions. His desire is that these manuals in so far as he is personally connected with them, shall contain only absolutely correct information concerning the subject-matter under consideration.

## PREFACE

The subject-matter treated in this manual under the heading of "Exterior Painting," will describe the reasons why painting is done upon surfaces exposed to the inclemencies of the weather and by graduated steps explain the various tools and appliances needed in doing the work as well as their proper manipulations and will then proceed to their application on the various surfaces and material which are used in house construction, giving reasons why the painting is done in the way described in each instance.

The text will be divided up into paragraphs, or series of several, bearing upon one point only of the subject-matter and each will be numbered in order that if there should be a necessity to refer to the same, it will be an easy matter to look them up. The questions also will be numbered with the same numbers as that of the para-

graphs which contain the answer, thus enabling the student to verify if his own answers are correct.

## LESSON I

### REASONS FOR PAINTING THE EXTERIOR OF BUILDINGS

1. The reasons for the painting of the exterior of the surface of the various material used in the construction of buildings are varied and many of them. The elements composing our atmosphere: oxygen, hydrogen, etc., are very active in entering and combining with other elements for which they have an affinity. This new combination usually is produced at the expense of that of the material with which atmospheric air combines; thus hydrogen in the shape of moisture lodges in the pores of wood, causing its decay, by destroying the tenacity of its fibres, with the assistance of oxygen.

Hydrogen likewise paves the way for the quick action of oxygen in combining with iron and causing it to rust. Rust itself being an oxide of iron.

As air is more or less loaded with gases, especially sulphurous gases, which are generated in many localities, acts as a carrier for it and by aid of its hydrogen, cause them to enter the pores of marble and all sorts of stone of lime formation, causing their more or less speedy destruction by the sulphuric acid's agency with which they are loaded.

Moisture alone will in time cause the hardest stones to decay, simply by its being turned to ice. The slow but sure forcing of a small crack filled with water, which has been turned to ice by cold, will in time split the strongest granite.

Therefore, oxygen, hydrogen, sulphurous gases conveyed and carried by moisture for which sulphuric acid has a great affin-

ity, may be said to be the main causes of decay in unpainted material.

2. It was shown in the preceding paragraph what were the leading causes which produced decay in the various material used in building construction. It stands to reason that the remedy must be of such a nature that it will interpose itself between the surface that is intended to be protected and its enemy—the atmosphere or rather the elements composing it and other enemies which do not enter directly in its composition, but which they disseminate and carry.

In other words, it must cover the surfaces to be protected and prevent the access of the elements to all parts exposed to their action.

This is really what paint does and but for this beneficial covering, the life of all surfaces of wood and iron especially, would be but short-lived. Its covering if properly applied, will form an impervious coat-

ing over the surfaces it has been applied to and the elements will have to destroy it first before they can have access to the material thus protected.

The material composing the paint in itself would not accomplish the object of preservation but for the thinner used for its application—i. e.—linseed oil. It is chiefly through its agency that the pigment becomes hardened into a solid covering over whatever it has been applied. Linseed oil and several others also known as "fixed oils," have the property of combining with oxygen and of forming a hard waterproof rubber-like gum, which has sufficient elasticity to conform itself to the contraction and expansion of the various material used in house construction.

3. Another very important reason why buildings should be painted exteriorly is that of *beautifying* the buildings thus treated. Without paint it was seen that they would soon decay, but besides this de-

cay and while it is going on the bright surface of the new material is becoming more and more an object of ugliness, plainly indicative of the deterioration slowly taking place on its surface, and instead of being an object of pleasure to look at, it becomes an eye-sore. While painting for beauty is only of secondary importance (preservation being the first object), to many persons it is considered of even of greater importance than merely that of *preservation.* To people of means, who can afford to have everything they own looking at their best, it may well be to them of more importance than the other. As an embellishment for surfaces, painting has been resorted to for a countless number of years.

## QUESTIONS

1. What causes the decay of unpainted building material upon surfaces exposed to the weather?

2. In what manner does paint protect

the surface of material over which it has been applied?

3. What other good reason exists for the painting of exteriors of buildings?

## LESSON II

### MATERIAL

4. Under this heading "material," every thing that is required or useful in painting must be included—not only the pigments and vehicles used in preparing the paint itself, but the accessories which are necessary for preparing the surfaces for painting.

5. Under the name of "Colors, what they are and what to expect of them," a manual is published which covers the ground of material used in painting much more fully; their derivation, manufacture and chief points of usefulness and peculiarities; therefore, it will not be necessary to go into any details regarding any of

them here and the student is referred to it for such information as he desires concerning any useful pigment or color. A mere enumeration is all that is necessary therefore for present use.

6. For the purpose of facilitating the study of pigments and of helping the student to hunt up quickly information concerning any of them, they have been divided up, according to their color into seven general groups.

7. 1, The whites; 2, the blacks; 3, the blues; 4, the browns; 5, the greens; 6, the reds; 7, the yellows.

8. The useful colors composing the white group consist of: White lead, zinc white or zinc oxide; whiting, kaolin, gypsum, white, silicate and Baryta white.

9. The most useful blacks are: Lamp black, ivory black, gas black, charcoal black, graphite.

10. The chiefly used blues are: Ultramarine blue, Chinese and Prussian blue, Co-

balt blue, ceruleum, and many other of little use for exterior painting.

11. The browns are very useful in exterior painting and some of the most useful tints are made from the following: Raw and burnt umber; raw and burnt Sienna; Van Dyke brown; the so called metallic browns.

12. The green pigments, useful in outdoor painting, are not numerous and consist of Chrome green, Cobalt green and green ultramarine, the many others being only of interest to artists.

13. The red pigments are of great use in the preparation of tints and also in their self colors for many purposes in outside painting, the following list comprises the most useful ones: Vermillion, Venetian reds; Indian reds; the red lakes, red lead and red ochres.

14. The yellow group also furnishes some good pigments for outside painting and some of them would be hard to spare,

the useful ones consist of the many varieties of Ocher, Chrome yellow, etc.; the many others are of little use, if any, in exterior painting.

15. The list has been purposely cut down, as a large number of pigments of doubtful utility even to artists and of none whatever to an outside painter, are to be found in all lists of colors and they would only create confusion in the mind of the student in the present connection at least. As stated before, for fuller details concerning any of the pigments named and of many others not included in this list, the student is referred to the manual of this red series entitled, "*Colors.*"

## QUESTIONS ON LESSON II

4. Define what is meant by material.

5. Give the summary of "how the subject-matter will be arranged in this lesson.

6. In how many groups or classes are pigments divided?

7. What are these groups?

8. Name the principal pigments composing the white group.

9. Name the principal pigments composing the black group.

10. Name the principal pigments composing the black group.

11. Name the principal pigments composing the brown group.

12. Name the principal pigments composing the green group.

13. Name the principal pigments composing the red group.

14. Name the principal pigments composing the yellow group.

15. Some general remarks concerning the above lists.

## LESSON III

### VEHICLES OR THINNERS

16. In the previous lesson the pigments or the solid portion of paint has been reviewed. They are usually ground dry and powdered as finely as needed; but such powders would not adhere to the surface of a building. They have to be mixed up with some liquids in order that they can be brushed and applied properly. They could be mixed with water and sometimes they are for interior work, but it stands to reason that this would not do for outside painting, as after the water had evaporated, the pigment would be in the same condition that it was before and rains or winds would wash or blow off the dry powder from the building.

17. The thinner or vehicle for paint must possess the property of a binder in order to fix the pigment firmly and hold it onto the surfaces over which the paint has

been applied. The "fixed oils" are wonderfully well adapted to the purpose of paint mixing. These oils have the property of absorbing oxygen from the atmosphere and at the same time and by virtue of this absorption of solidifying and of being turned into a waterproof elastic rubber-like gum which is really *"the protection"* which painting gives to the surfaces over which it is applied. It seals them by entering their pores or minute openings, filling them solidly and spreading water and air proofing coats over them, which prevents the injurious action of the elements as noted in lesson I. The student is again referred to the manual entitled, "Colors" (what they are and what to expect of them), in order to find more minute details as to their peculiarities, dryings, etc.

18. The only fixed oil which will be noted here is that king of them all—*Linseed oil.* As it is by far the best, the most useful and the cheapest of all of them, it

is the only one which will be examined, as all the others while of use for certain specific purposes in interior painting—none no matter how costly—possess such good binding qualities as linseed oil and therefore can well be omitted and dispensed with.

19. Raw linseed oil is the only condition of that oil which is proper for the painting of exteriors. In that state it is elastic and when dry, it will give sufficiently and adapt itself to the expansions and contractions of the surfaces painted with it, that there will be no cracking of the paint, as would follow if it did not possess the proper amount of elasticity.

20. Boiled linseed oil at one time was used much more extensively than it is now. Boiling linseed oil renders it more drying, but its elasticity is destroyed by the process and painting done with it is much more liable to crack; therefore, its use for outside painting should be discouraged. The boiling of linseed oil has an-

other bad effect as it makes it less penetrating, so that if it should be used in the priming coat for instance, it would not go into the pores near as deeply as the raw oil does with consequently less tenacity and more likelihood of scaling off.

21. Volatile oils are also used as thinners or vehicles in paint mixing. They are entirely unlike the fixed oils in their properties. It was seen that the fixed oils became dried or turned into an elastic waterproof rubber like gum which constituted the real protection of exterior painted surfaces. The fixed oils do not evaporate, but are changed into this gum-like condition by oxidation. On the contrary, the volatile oils *do evaporate* nearly or so much so, that it can be said that they evaporate *entirely* away, so that in so far as acting as a binder for the pigments, there is but little more if any than there would be in using spring water in their place.

Their use in paint mixing is a mechani-

cal one—they dilute the linseed oil and by their quick evaporation cause it to set quicker and to lay more evenly. In cold weather, by rendering it less viscid and more penetrating reasonable quantities mixed with it are of real benefit—even in the priming coat for it will enable the otherwise viscid linseed oil to enter the pores more deeply—this is true only in cold weather and even then but little should be used, just enough to accomplish its legitimate employment.

In all but very cold freezing weather, its use should not be resorted to in warm weather for the last or finishing coat. As more will be said concerning such use when the operations of putting on the paint is reached; the above will suffice for the present.

22. Turpentine is the chief one of the volatile oils used in painting. It is derived from our own American yellow pine. It is however, becoming scarcer and scarcer

year by year and substitutes will force their way into use and are already doing so.

23. The various volatile oils derived from crude petroleum by distillation, are used and have been used for some time. Their evil smell is against them. Benzine, naphtha, and even gasoline are utilized in paint mixing, but as long as they are not more completely deodorized, it will be hard for them to find their way into general use as long as turpentine can be procured even at higher figures than it sells for now.

## QUESTIONS ON LESSON III

16. Some general remarks concerning thinners and vehicles.

17. What is said of fixed oils?

18. What is said of linseed oil?

19. What are the properties of raw linseed oil?

20. What are the properties of boiled linseed oil?

21. What are volatile oils and what are their uses in painting?

22. What is said of turpentine?

23. What is said of volatile oils of petroleum derivation?

## LESSON IV

### ACCESSORY MATERIAL

24. In lessons II and III the material required for the proper mixing of paint was enumerated and so much of their properties explained as was necessary to comprehend their various functions in making up paint to apply to exterior surfaces.

The following are not used in the preparation of paint mixtures, but are useful accessories either in preparing for the painting proper, or to make it look better.

25. Frequently the lumber used in wooden buildings is anything but perfect;

it usually has many knots and parts which show an exudation of rosin or gum; painting done over such parts will not remain in a sightly condition very long before this resinous matter will come through the painting and not only greatly mar its appearance, but it will destroy it and cause it to scale off the surface. Therefore, it is of the greatest importance to stop this injurious action and this is now universally accomplished by coating over such places with some substances which will seal them up and prevent the exudation named.

26. While the *spirit solution of shellac* which is almost universally used for this purpose is not perfection, when its application has been well done, it is comparatively safe to do painting over it. It is usually bought ready prepared for use under the name of "Shellac varnish," but it is easily prepared by simply taking wood or denatured grain alcohol and the shellac itself (the orange is the best and strong-

est), let the two macerate for a few days in a moderately warm place and the alcohol will dissolve it completely if not surcharged. About three and one-half pounds of shellac will make five quarts of varnish with one gallon of alcohol. This will give a fairly stout solution. If given much thinner than in the proportion named, it may be too weak to rely upon to stop the oozing out of the sap or rosin.

27. Putty is another one of the accessories which must be used in levelling and filling up nail and other holes after the priming of wooden buildings, and also cracks, and poor joints. It is also useful in brick painting after the priming coat in levelling holes in poorly made brick as well as filling up the mortar lines where the mortar has been unevenly put on. Putty is usually bought ready prepared, but can be easily made by simply taking finely bolted whiting and adding thereto sufficiently of raw linseed oil to make the mass of the

right consistency for proper working under the putty knife.

29. Sandpaper and steelwool are useful adjuncts to level up painted surfaces. It is required frequently in outdoor painting to cut down dirt and dust which the winds have blown upon the painting before it was dry and also to smooth down puttying, etc. This completes the list of absolutely necessary accessory material.

## QUESTIONS LESSON IV

24. Some general remarks concerning accessory material.

25. What is said about knots and resinous parts in wooden buildings?

26. How are spirit solutions of shellac made?

27. What is said regarding putty?

28. What is said concerning sandpaper?

## LESSON V

### TOOLS AND APPLIANCES USED IN PAINTING

29. There are two groups of tools needed by painters. First, the ones used for applying the paint which consist chiefly of brushes; second, the tools needed in preparing for the painting or required at any stage of it.

The appliances are devices which are used to facilitate the painting or any operation connected with it or in the preparation of material used in painting. The bulk of it consists in more or less ingenious devices for getting at the surfaces to be painted.

30. The principal tools as stated in the preceding paragraphs are brushes.

In the matter of their selection one must not be led to think that because some brushes are listed cheap that they will prove as economical in the end as much higher priced ones. Quality is of far more

importance than mere price. If for instance a wall brush can be bought for say $8 per dozen and a brush will last eight or ten days in condition fit for the proper application of paint, one must not suppose that another of the same width at $20 per dozen is high in cost as compared with the other. The latter will probably be in pretty fair condition after a month or five weeks of constant work, but this is not the whole story by any means, for the man who handles it will do one-third more work with greater ease to himself than the one handling the poorer brush. It is an easy matter to figure for oneself what this extra and better work represents. On the average it will be fully twenty-five per cent greater or in other words, if wages are $4 per day, it represents a saving of $1 per day or more than the first cost of the poorer brush; now multiply that by thirty and you will readily see that the low cost brush is a very dear investment in

the end. The quality of the work done will be better, so that the advice is given, not to be misled into the buying of low-priced brushes, thinking that there will be a saving in doing so.

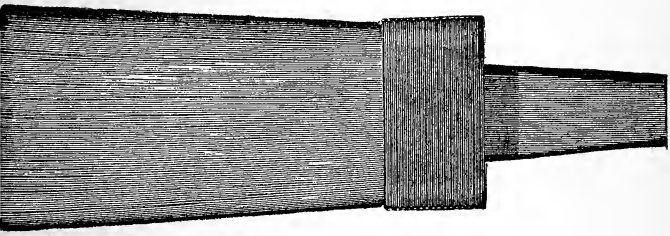

FIG. 1
Round Paint

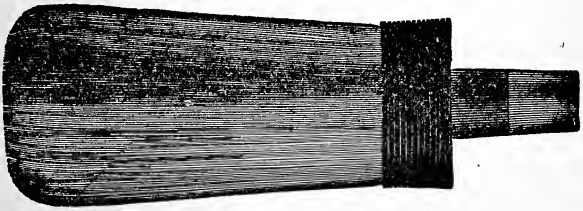

FIG. 2
Oval Paint

32. The brushes mostly used in exterior painting are but few, although the quality and sizes of each are many, in order to accommodate the ideas of all kinds of people.

The ones which are probably mostly used are the wall brushes, of which some are round as in figure 1, some oval as in fig-

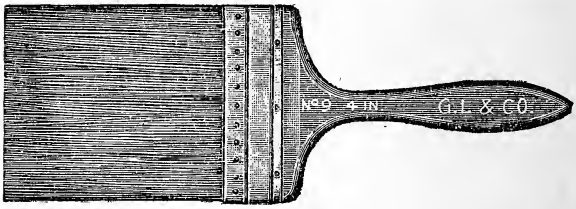


FIG. 3
Flat Wall Metal Bound

ure 2, and either wire or twine bound, or set in rubber. The sizes run from 1-0 to 8-0.

Wall brushes used for the same purpose are made in the flat shapes and are bound by metal strips on their wooden heads, as shown in figures 3 and 4, or by nailing to the heads by leather strips, when they are

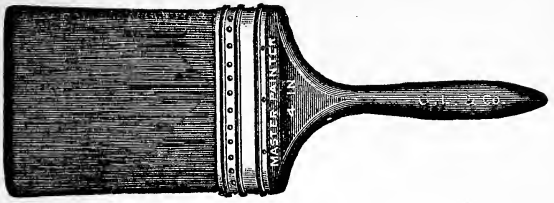


FIG. 4
Flat Wall Metal Bound

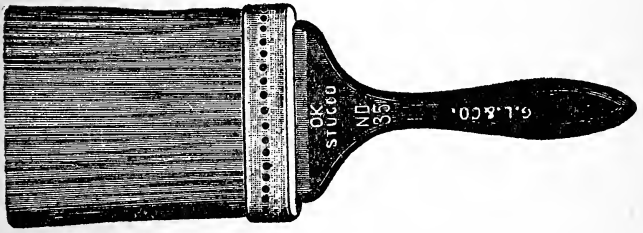


FIG. 5
Stucco Wall Leather Bound

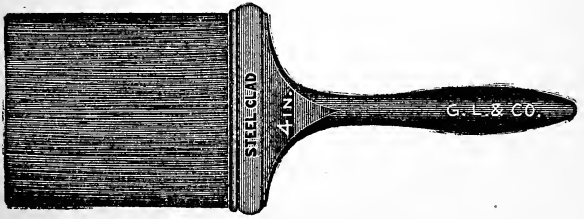


FIG. 6
Flat Wall Rubber Set

then known as stucco wall brushes as in figure 5, or set in rubber with a steel clasp encasing it as in figure 6.

The flat wall brushes are sold according to their widths and usually are graded by half inches, from two inches to four and one-half inches wide.

The duster is an all important brush in exterior painting as dust from the ground and sand paper dust must be carefully removed before applying the paint. Figure

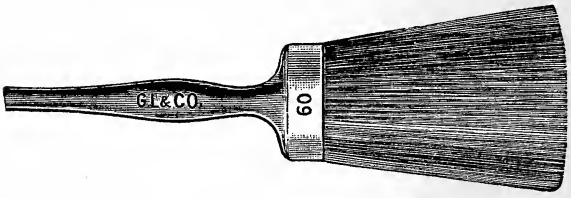


FIG. 7
Round Painters Duster

7 shows the round duster and figure 8 the flat forms of that tool. They are usually made in two or three sizes and in many qualities of the stock used.

The sash tool properly speaking is a small oval or flat brush and our figure 9

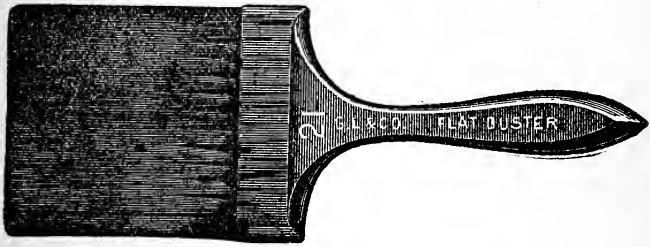


FIG. 8
Flat Painters Duster

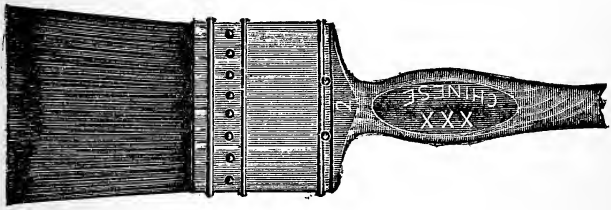


FIG. 9
Sash Tool

will suffice to illustrate the shape of that brush. The oval also comes chisel edged. The oval sash tools usually from No. 6 to No. 9, the size increasing with the numbers, the flat 1 to 2 inches wide.

At the present time many prefer to use a flat brush for the purpose and any of the inch, one inch and a half, or two inches, chisel edged, double thick varnish brushes answer very well for this. Figure 10 shows the usual shape of the chisel edged varnish brushes used as sash tools.

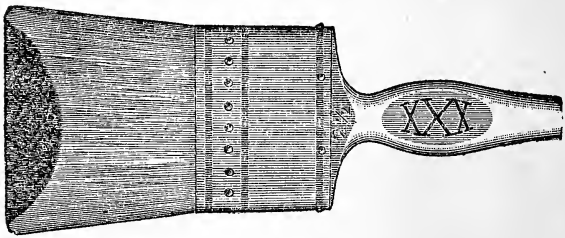


FIG. 10
Flat Varnish Sash Tool

In the preparing of iron surfaces for painting, it is frequently required that rusty spots be removed from them and for this purpose wire brushes have been devised, shown under figures 11, 12 and 13.

It is sometimes necessary to make lines on brick work in imitation of mortar lines

and sometimes in imitation of mortar lines on stone work. Figure 14 shows one used on the longer lines, a shorter one of the

FIG. 11
Wire For Cleaning Iron Rust

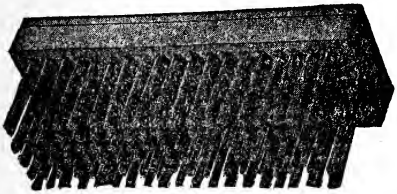

FIG. 12

FIG. 13

same shape is used in marking out the separate brick.

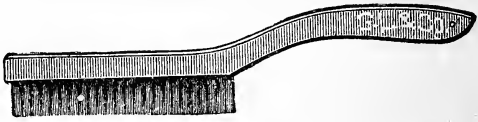

FIG. 14

A few flat bristle fitches such as are shown in figure 15, will be found useful in getting at quirks and runlets, where an ordinary brush would not reach readily.

The above are the brushes ordinarily used in outside painting and while no doubt many others are or could be used, these will suffice to produce any other than ornamental painting. This forming the subject-matter for another volume of the red series will not be touched upon at the present, as all the available space will be needed in connection with the subject-matter.

It is very important to have a good brushkeeper in which the brushes can be

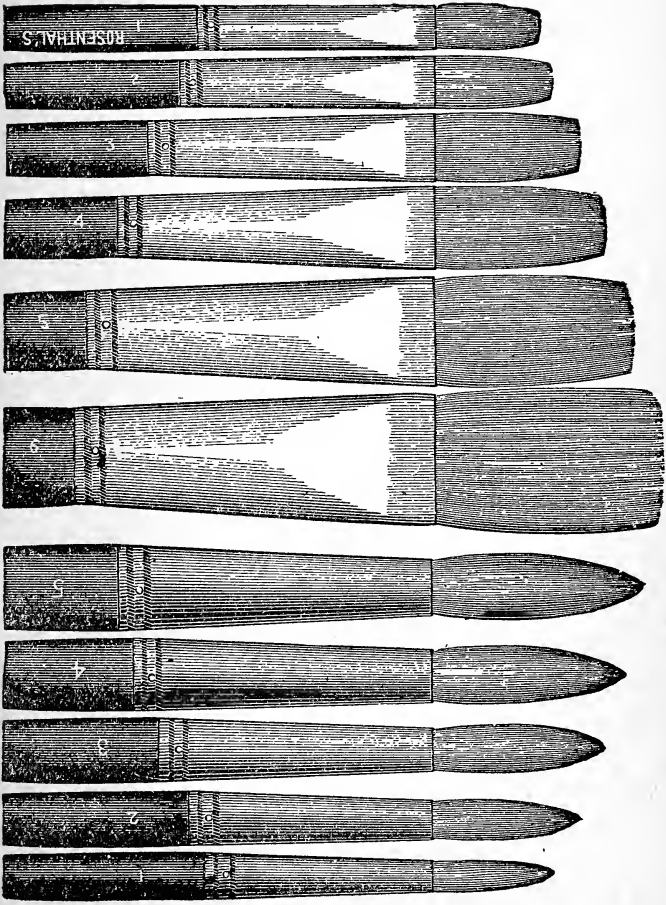


FIG. 15 Artists Flat Fitches

suspended in water or raw linseed oil, so that the end of the bristles shall not touch the bottom. There are a number of good ones ready made; but a homemade one which will insure the requisites demanded of them is fully as good.

32. Putty knives and scraping knives are required also—the former in order to fill up and smooth over nail holes and cracks in new work and old in wooden buildings and mortar joints in brick or stone—the latter in scraping off old paint when removing the old coats. (See figs. 16 and 17.)

Palette knives also are useful tools to have about in examining pigments and in triturating them in mixing tints and many other uses for which they are handy but not indispensable.

Strainers and other tinware, better known as painter's tinware, shown in figure 18, are articles to have on hand when needed, while they are not absolutely required, as substitutes can be used instead.

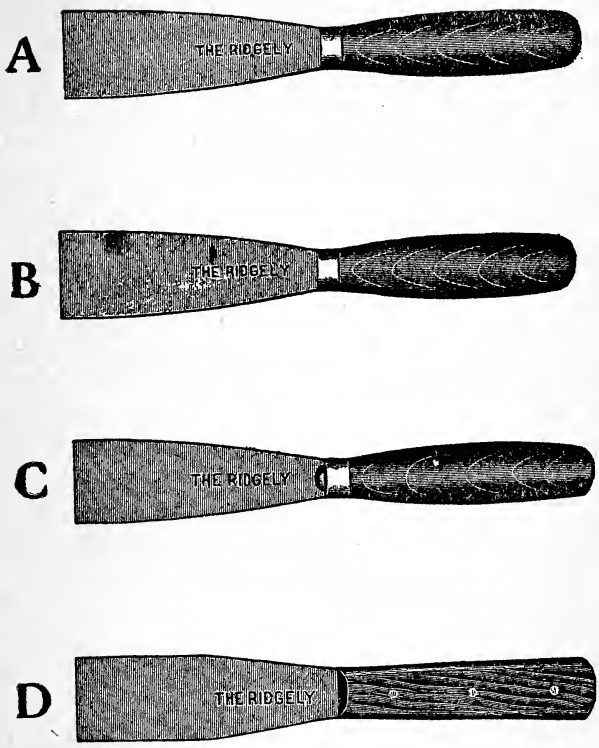


FIG. 16
Painter's Putty Knives

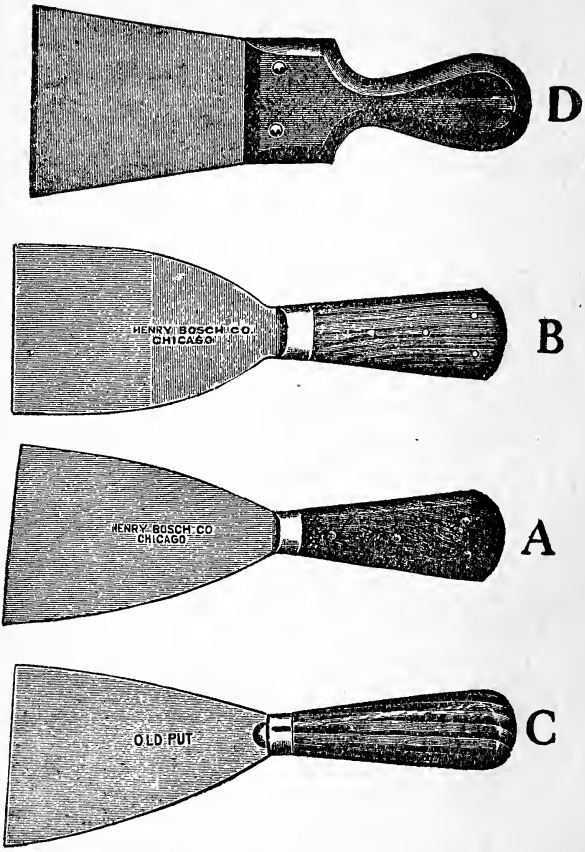


FIG. 17
Painter's Scrapers

A sand bellow is also a tool which can be dispensed with, but throwing sand by hand does not do the work near so well, nor so fast. One is shown in figure 19, but there are many other forms of it which are fully as good as the one shown.

FIG. 18
**Painter's Tinware**

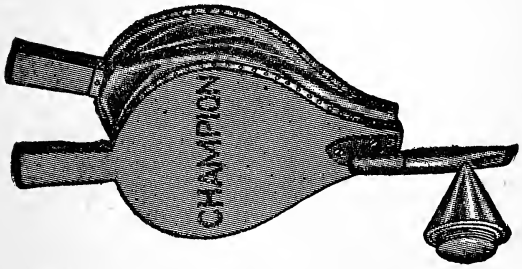


FIG. 19
Bellows Sander

## QUESTIONS ON LESSON V

29. Some general remarks concerning tools and appliances used in exterior painting.

30. What is said concerning brushes and other tools?

31. Name and describe the leading brushes used in exterior painting.

32. Name other tools used in connection with exterior painting.

## LESSON VI

### APPLIANCES USED IN EXTERIOR PAINTING

33. The most important appliances that are used in connection with exterior painting are those which enable the painter to get at his surfaces in order to be able to paint them. So ladders of various sorts, swing scaffolds, etc., are the most important ones among them and as such deserve

the first place in describing these appliances.

34. The ladders are either known as single where only one is used, or as extension, where two or more are connected together and can be extended up at will.

The single as well as the extension ladders should be made from strong well selected Norway pine, which should be flawless and perfect. It is better to pay a little more per foot to make assurance doubly sure that the workmanship as well as the material is of the best. Second growth hickory rungs which should only penetrate one-third of the sides and then be screwed in, are the only ones that are safe when fastened in that way.

Fig. 20 represents the single ladder.

Fig. 21 is typical of the extension ladders.

Fig. 22 shows a single ladder with a hook fastened at the top, by means of which

the ladder can be securely fastened to the ridge of the roof.

FIG. 20
Single Ladder

35. But where buildings are more than two stories up from the ground, it is impractical to do the painting from ladders and when over three stories, impossible to do so; therefore, a swing scaffold must be used for this purpose. This consists of a platform which may be a ladder covered

FIG. 21
Extension Ladder

over with planks, but better one made especially for the purpose. At the ends, the crosspieces or stirrups may be made of iron or good inch manilla rope, into the ends of which a single block is fastened and with a double block at the top through which a good strong manilla rope of not less than three-quarters inch in thickness, is passed but better a seven-eighths or even

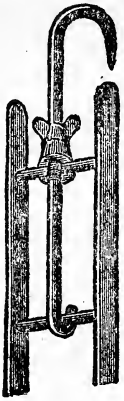

FIG. 22
Roof Ladder

an inch one. Each end must have the same double and single blocks, as otherwise they might not work harmoniously. The double blocks are fastened into the cornice hooks, which hook over on the flat side of the roof. Where the roof is slanting, however, it will be necessary to have some secure device upon which the end of the hook may rest. There are many kinds made and for sale; the one shown in figure

23 is about as good and safe a one as can be found.

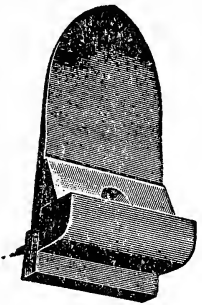

FIG. 23
Roof Bracket

In figure 24 a complete swing scaffold is shown ready for operation.

36. In working over porches or piazzas and under them, it is necessary to have step ladders and trestles to support walking planks.

Fig. 25. Shows several forms of step-ladders that are safe and made with a view to stand the hard usage they receive at the hands of painters, some can even be used as trestles.

Fig. 26. Illustrates a walking adjustable walking plank, used between two trestles.

37. When painting low buildings, it will be found very convenient and at the same time a speedier way of doing work, to have

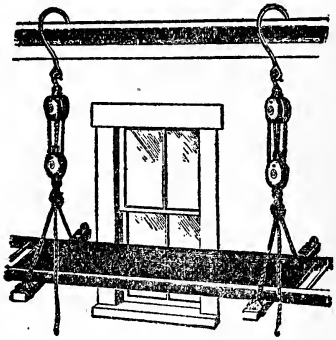

Fig. 24
Swing Scaffold

two ladders against the side of a building; using the rungs as a support for brackets, better known as ladder jacks, through which walking boards are passed through, upon which the workman can handle a

wide stretch of painting at a time, saving much time in the moving of ladders and enabling him to do the work with more ease to himself. Figure 26 illustrates the form of ladder jacks of which there are a

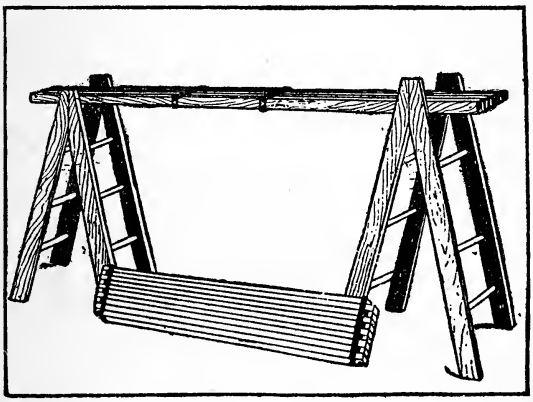

FIG. 25
Extension Plank

great number in the market.

The above list contains all the really important appliances needed to reach any and all the surfaces usually in the painting of buildings outside. The list could be

swelled to many times the size it is by adding the many special devices that come out every year and while some of them occasionally prove useful, the majority of them do not prove so to the extent of forcing the old ones out of business.

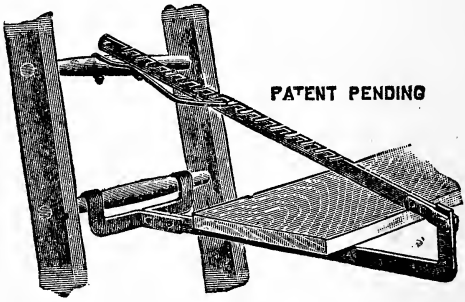


FIG. 26
Ladder Jack

## QUESTIONS ON LESSON VI

33. What is said concerning appliances used for outside painting?

34. Give a description of the ladders.

35. What is said concerning the swing scaffold?

36. Give a description of step-ladders, trestles and walking boards.

37. What is said of ladder jacks?

## LESSON VII

### THE PAINT SHOP AND ITS ARRANGEMENT

38. In order to do outside or any other kind of painting for that matter in a professional way at least, a location should be secured for the taking care of the material and tools, appliances, the mixing and compounding of paint, tints, etc., to say nothing of the selling of material to customers, which is a purely commercial affair, but which may or may not be connected with the shop.

The paint shop need not be an expensive affair, but when it is not connected with a store, may be located in some outhouse or loft. The practice of many is to locate it in some basement where the light is deficient and frequently where there is much

dampness; this is altogether wrong, the shop should be where there is good light and it should be dry, especially where there is much varnishing done and repainting of blinds, the latter requiring the best of light in order that the work may not be slighted.

It was stated that the shop should not be damp; for if it is, mildew will surely destroy all paper packages and cause varnishing to go wrong, to say nothing about the unhealthy conditions which go with such, nor of the unpleasantness of the surroundings.

39. The shop should be shelved and a portion of the wall space should be divided up into drawers for the holding of dry colors, etc., the shelves being used for the holding of canned goods and such tools as cannot be readily put into drawers.

Mixing tubs for the breaking up of white lead and the mixing up of tints should be provided and these should always be prop-

erly cleaned and made ready to be used again as soon as they have been emptied.

A lye barrel should also be provided into which all paint skins, pot cleanings, etc., can be dumped in.

A good sized keg or vessel should be provided into which all leavings or surplus paint remaining after a job has been completed, can be poured in and from which many jobs can be primed to good advantage. Really two such vessels should be used in every shop—one into which all paint with a preponderance of linseed oil should be poured and the other to be used for the dumping in of paints containing much turpentine or other volatile oils.

40. It is important to know the quantity of material that is used on every job, therefore a good scale should be provided wherewith to weigh everything that goes out on every job and a record should be made of the same. When paint is returned, it too, should be weighed and it should be

credited to the job whence it was returned. It is needless to say that in returned paint a deduction must be made, for it is not as valuable as it was when prepared for it in the first place.

41. There should be a set of books provided, wherein a record of all transactions may be made and the card system of accounts will be found the simplest and easiest, as each separate deal can be found in their fullness in short order without the having to consult half a dozen separate books. It will also be found much the best system in keeping track of the employees and of their doings.

42. It is very important that there should be plenty of water handy in paint shops as well as sinks into which washings can be performed; and while the same may be provided in other ways such as carrying water from a well or cistern, etc., yet considerable valuable time is thus wasted and in cities where water works exist, it is a

very poor plan to resort to the makeshifts named above.

In country towns where there is no water system, of course such devices as will accomplish the object, must be put up with.

Shops should also have a stove, either a gas stove or a gasoline or kerosene, for the preparation of water colors and the many objects which really pertain more to the painting of interiors than to that of exteriors. Under that head more will be said as to their use and the reader is referred to the volume of the red series, entitled "Interior Painting and Decorating in Oil and Watercolors," for a fuller complement for the paint shop.

## QUESTIONS ON LESSON VII.

38. Give a description of what a paint shop should be.

39. What fixtures are needed in a paint shop?

40. What other fixtures are useful in a paint shop?

41. What is said concerning the keeping of accounts in the paint shop?

42. What is said concerning water, sinks, stoves, etc.?

## LESSON VIII

### THE PREPARING AND MIXING OF PAINT

43. In order to better understand the application of paint to outside or any other kind of painting, it will first be necessary to consider the make up of paint into the proper condition for its application.

It is not intended just at this time to enter into the merits or demerits of any particular pigment entering into the paint composition. More will be said however, when the various surfaces over which paint is applied outside is considered.

The mixing of pigments and the producing of tints by their intermixing will be

taken up in a general way. Every painter should be familiar with this and he should know how to prepare tints as well as "how to apply them."

44. All pigments can be mixed alone by themselves with linseed or other fixed oils and will make a paint, but many of the pigments have a color which may not be desirable nor ornamental, especially for the covering of large surfaces upon the exterior of buildings. While all pigments have their uses either by themselves or for the making up of tints, but few of them enter very largely into the compound which is usually used for such painting. Fashion decrees to a certain extent the colors or tints which should be used. Some years the fad is more on the darker shades and again the mode changes to white or very light tints.

45. But be the tints dark or light, they require a white base upon which to build them. White lead is the only white pig-

ment with possibly the exception of zinc white, which possesses sufficient opacity or covering properties that can be used in connection with other pigments for tint making, as otherwise the strength of the coloring of many of these would require enormous quantities of the other semi-transparent whites to produce the tints desired. Besides, all the other white pigments aside of lead or zinc would muddy up the tints as they do not make perfectly white tints when mixed by themselves with linseed oil.

For all paint mixing even zinc is but seldom employed except when used as a corrective of white lead. So that the base of all light tints may be said to be white lead.

46. White lead comes in packages containing 500, 250, 200, 100, 50, 25 and 12½ pounds of paste of lead and linseed oil ground together. This paste is very stiff and must be reduced to a much thinner

condition before the tints can be made and therefore the contents of the lead package or so much of it as will be required, must be mixed up with linseed oil to reduce its consistency. This is called the *breaking up* of the lead in the painter's vernacular. The mixing tubs which were spoken of in paragraph 39, will be required for this purpose. The process of breaking up the lead is simple; all that is required is a strong wooden paddle and the addition of linseed oil in small quantities at a time with plenty of elbow grease in triturating the stiff paste so as to make it absorb the linseed oil. More linseed oil should be added from time to time as it is being absorbed, until the mass can be poured out. It should not be reduced too thin, however, and should be very much stouter and thicker than paint is required to be for application. When it is in the condition described and all the particles of lead have been reduced to a uniform smooth paste, then only is it in the

proper condition for the addition of the coloring pigments.

47. The coloring pigments require a somewhat different treatment than the base. Like the base they should be poured out of the cans and linseed oil should be added to the paste and the whole stirred up together until well amalgamated and of a uniform consistency; but instead of stopping when a rather heavy paint condition is attained, as stated for the white lead, the thinning with oil should continue until the mass will pour out readily. In short, it should be thinned even more than is needed for application with the brush.

The reason for this is that when in a rather thin condition the coloring pigment particles will be well divided up and will be easily absorbed and assimilated with the white lead base, while when left in a stiff paste it is difficult to mix it in properly and certain portions remain unmixed with the consequence that when

taken up by the brush and spread out, such will show up of a much darker tone than the rest of the shade and it is very difficult to attain uniformity, as with a well-thinned paste.

Should there be more pigment thinned out than is required for the present purpose of making a tint, it need not be wasted, as the liquid can be poured into wide mouth bottles, with covers or any other vessel that has a cover, which will keep out the dirt. It is the most economical manner of handling the contents of the small color cans. As it is usually done, as much color is taken out of them as will answer the purpose of the one making the tint and the rest to skin up and dry. In a few months, if the colors have not been used up, half of it will be spoiled, full of skins, or hardened and always an aggravation to the one who has to use them.

48. In the making of tints, one is supposed to know the order in which each

pigment entering into its make-up in the greatest quantity and the coloring should be added to the base in that order. The whole should not be poured in at once, but very gradually and well stirred up before more is added, as it is a very easy matter to pour in more color if needed, but impossible to take it out if too much has been used. The only way then is to put in more lead to lighten it up, but then too much paint is thus prepared which means a lot of unused paint and a loss.

## QUESTIONS ON LESSON VIII

43. What is said in a general manner concerning the preparing and mixing of paints and tints?

44. What is said particularly about the mixing of tints?

45. What is said about the base to build the tints upon?

46. How is the base prepared ready for the addition of the coloring?

47. How should the coloring pigments be treated previous to being added to the base?

48. How should the coloring pigments be added to the base?

## LESSON IX

### HOW TO MAKE THE TINTS

49. It is not the intention of giving the student a long list of fancy named tints nor to tell him how to make them. He can find that information more fully given as well as about the peculiarities, provenance, etc., of each one of the pigments, in the red serie manual, entitled "Colors, What They Are and What to Expect from Them." But in connection with the subject-matter of this manual, he should know how to get up the leading tints and shades that are used in outside house painting.

50. The various tints may be grouped into the following, according to their hue:

The yellow toned tints.
The reddish toned tints.
The bluish toned tints.
The greenish toned tints.
The blackish toned tints.
The brown and drab toned tints.

51. In preparing the tints having a yellow tone, the ochres will be found by far the most useful. They are permanent, especially those which are natural and which have not been doctored up with Chrome yellow and they are to be found in many shades, giving and making tints with the white base of various tones.

From ochre alone it is possible to make a numberless list of tints ranging from an ivory white onward in density through the cream, light buffs to the darkest of them to nearly the self tone of the ochre.

52. Next to the ochres, Chrome-yellow is the only other pigment which need be considered in making tints for outdoor use. As it is some very pretty effects and

tones are made from it alone or in connection with ochres. The range of color of the Chrome yellow is much greater than that of the ochres, as they run the gamut from the faintest canary yellow upward through the lemons, neutral tones of medium yellow to light orange and to such dark shades of the orange that one would call it a red as it partakes so much more of the red than it does of the yellow.

The list of tints and shades that can be made from them is innumerable. The Chrome yellows when well made are fairly permanent except in situations where sulphurous gases are likely to develop. Sunlight affect them somewhat too and their tints are not so durable as those made from ochre.

53. The reddish tints are not as extensively used in outdoor painting as the yellows, but are usually used in connection with the yellows to warm up their tones and in the making up of the terra cotta

shades, also with them. The most permanent are the colors which owe their coloring to iron oxides, such as the Venetian reds.

The Indian reds are also of this class and they produce with a white base a wide range of purple and lilac tints, which are fairly permanent.

54. A pure toned blue tint is very seldom used in the painting of exterior surfaces, the only situation where they are used is for the painting of the ceilings of porches and piazzas but of a very light shade. As adjunct in combination with other colors and the producing of compound tints, they are very useful.

The ultramarine blue is the most permanent of any. Prussian blue is fairly so, but strong sunlight affects it and the tints made from it with white lead also.

55. The greenish tints are much more used in outdoor painting than the blue—although seldom without being toned down by the addition of other pigments when

they are of a striking positive shade. The tints of it mostly used are known under the name of olive greens, sage, apple, willow and a number of other fancy names, all, however, being toned down considerably from their bright original hues.

The only exception is in the painting of blinds with white houses, where the brightest and most vivid grass green shades are usually selected for the purpose.

56. The greys which mainly are reductions of some black pigment with white lead, are most extensively used where cool tones are desired in exterior painting. They look clean and where properly balanced with pure white or very light trimmings, certainly look clean and tasty.

Lampblack, which is far from being a jet black, is the best black (if good) for the making of clear toned greys which may run from a faint pearl grey through innumerable gradations, up to a dark slate

color, simply by the addition of more or less white lead. Drop or ivory black makes good greys also. Many shades of grey require the addition of other coloring pigments.

57. The brown or drab shades are also very useful in exterior painting and a multitude of shades belonging to this group are used for the purpose. These drab greys vary so much in tone and intensity, that it would be a hard job of finding a name to give to each one that it is possible to make from any of the parent color either used alone in combination with white lead, or blender together with some other additional colors.

Raw and burnt umber, Van Dyke brown, each of them make a line of tints peculiarly toned and when combined together and oftentimes when other pigments also enter in combination with them, a very long list of tints must result of it.

The above will suffice in order to give

the student a very fair idea of how to make all the principal tints used in exterior painting. Nothing has been said about the use of self colors as this is seldom done, excepting upon store fronts or on window sash. As they are usually specified before hand, this will present no difficulty even to the beginner.

## QUESTIONS TO LESSON IX

49. What is said about the scope of this lesson?

50. In how many groups may the many various tints be classed in?

51. What is said concerning the making of yellowish tints from ochres?

52. What is said concerning the making of yellowish tints from chrome yellow?

53. What is said concerning the making of reddish tints?

54. What is said concerning the making of bluish tints?

55. What is said concerning the making of greenish tints?

56. What is said concerning the making of blackish or grey tints?

57. What is said concerning the making of brown and drab brown tints?

## LESSON X

### THE APPLYING OF PAINT

58. Applying paint with a brush is not a very difficult operation to master. At least, the putting of it on surfaces in *a way* is not, especially to the onlooker. So, while it is possible for an old lady or a common laborer to take hold of a brush and put paint on in some sort of way, to become a good brush hand requires a great deal of practice, good judgment and conscientiousness if you please.

Some may want to know where the last comes in and for the purpose of enlightening them it may be well to say right here

at the beginning that, in priming especially, but also in all the rest of the coats of paint applied to exterior surfaces to a lesser degree, the paint may be skipped over the surface instead of well brushed in, and apparently it will look all right enough if the man understands the way of slighting his work so that if he has no conscience one may never know if the work has been well done until the subsequent coats have been applied when it is too late to remedy it.

While this conscientiousness should be exercised to its full extent in brushing the priming coats well into the wood, it should of course extend to the proper application of all the other coats.

59. The "modus operandi" of the application itself would be rather difficult to explain and the saying that it consists in brushing out the paint back and forth over the surface to be painted would convey about as much information concerning it as any that could be given, and then it

would not be giving much. It would be on a par with that given to a raw hand by the farmer to take a hoe and go to hoeing. It is simple and easy to look at, but the raw man will have to more than hit at the ground in order to do good hoeing and the novice painter will have to do more than rub the surfaces if he desires to do good painting.

The general principles of good painting are that 1st, the paint should be well rubbed in, but no surplus should be left on the surface, as if it is, it will either sag run or dry wrinkled up; 2d, it should be put on evenly, the brush marks layed off smoothly after the rubbing in. If the above is carefully and well done, the painting cannot help being good.

60. It is important to have good stout tin pails to hold the paint. They should be made with riveted ears to hold the wire bail extending above the rim of the pails and should not be too high as to make

them top-heavy; rather wider than usually pails of the same size that are made for general use.

61. The directions given as to how to mix up paints and tints in the paint shop in paragraphs 43 to 48 will answer in all their details for paint that is to be mixed and prepared on the job, and frequently it is prepared there instead of in the shop, especially if the job is a large one and the distance is great.

In the above referred-to paragraphs it is stated that the paint is in a stiffer paste than that in which it is intended to be used in the painting. The chief reason for this is that some of it will probably be needed for first, second and third coating, and as each require a different kind of reducing with raw linseed oil and turpentine, it could not possibly be prepared just right to suit the different requirements of liquidity the paint should have for the different coats. There is a still better reason for

it if the paint has to be hauled to the job from the shop, and that is that if it was thinned to even the rather stout condition required for third coating, that it would splash and slop over in the hauling.

62. While the following directions which are given below are general and can only be taken as a guide to the proper thinning required for the various coats, they will be found to apply in the majority of jobs done. Where some particular mixing is needed for certain kinds of painting and certain pigments, the same will be noted and the student will know how to vary from the general advice given here.

63. For the priming coat, the stock color must be very much reduced; for one must remember that the priming, as the first coat will always hereafter be designated, must penetrate the fine pores of either the wood or of the brick or stone work being painted. Should this coat be given with a stiff paint the pores would

soak and absorb the oil from it, with the consequence that the pigment would dry upon the surface without the necessary quantity of linseed oil required to hold it on properly and will dry porous and absorbent, ready to take up some of the oil used in thinning the second coat, which should have all it is thinned with for its own use.

The stock paint should be reduced to the last limit; all that is required of it is that a little of the pigment should enter into the pores with the oil and help close up the orifices. Enough pigment should be added to the oil to show plainly what its color is when well rubbed out but through which most of the veinings and details of the wood can be seen.

64. It is usually the practice to use some specially prepared priming into which the stock colors do not enter.

Some use ochre alone thinned with linseed oil. While a good silicate-based ochre

will do fairly well if thinned well and if it has been properly ground fine in oil, it is better not to use it alone for that purpose, and the use of American or clay-based ochre will cause trouble in the future; so that their use should be discouraged for the priming coats.

White lead alone or in combination with a good finely ground French ochre where the lead itself predominates, when well reduced with linseed oil makes the best of priming paint.

65. The priming coat thinner should be raw linseed oil only, when the weather is warm and when the surfaces to be primed are perfectly dry. Then the linseed oil is limpid and penetrating and will reach a good distance into the pores, filling them and when dry forming little tentacles or rootlets which serve to hold the superadded coats of paint.

In cold weather, however, the fluidity of linseed oil becomes impaired, and then it

becomes necessary to render it less viscid in order to restore it to a good degree of fluidity. The addition of a volatile oil is permissible for this purpose, and either turpentine, benzine or naphtha added in such proportion as to restore it to a good degree of fluidity is proper.

The objection made that it evaporates and has no binding properties is all right in good weather, but in cold weather it is not; for then it is possible to use more linseed oil to which has been added some volatile oil in the priming of a given space than could possibly be spread on by itself. This has been doubted by some, but the experiment is and can be easily made by anyone.

66. The painting of the second coat is for the purpose of giving a good foundation for the third or finishing coat. Upon wooden buildings and upon brick or stone walls there will be found some soft parts into which the priming coat has penetrated

deeper than it has in others, with the consequence that some portions of the work are still obsorbent of linseed oil, while the surrounging parts that are harder are well filled up and the drying of the priming has stopped all suction. Over such places the second coat of paint would dry on top of it and glossy, while upon the first it would be partially absorbed by the partially-filled soft parts to which a portion of its oil would be given with the consequence that it would appear partly flatted over them and the general surface of the job would show spotty or harlequin-like to the disgust of all lovers of good work.

67. The second coat of paint, generally speaking, again should be thinned with one-fourth turpentine or benzine added to three-fourths of good raw linseed oil. This, of course, applies to the thinning of the stock color, which contains already a large quantity of linseed oil, and in reality there will be but little over one-eighth of the total

thinner used that will be volatile oil with the percentage named. The addition of the volatile oil is to make it set quicker and that it may dry a trifle flat and porous in order to make a good foundation for the third or finishing coat. This second coat should be very much thicker than the priming coat and of about the consistency of good cream. It should cover well and solidly over the priming, but should be well brushed out and evenly distributed, and lastly, laid off in one direction lightly with the brush.

68. The third or finishing coat on new work should not be thinned to the same extent as the second, and nothing but raw linseed oil should be used for the purpose, as it is the completion of the painting. No volatile oil of any kind should be added, for there is more pigment in it than in the previous ones, and it will require all the thinner to hold it on and at the same time

form an impervious coating that will protect the surfaces painted.

When the second coating has been well done and it has dried thoroughly and hard, the third coat should show a perfectly even surface and glossy all over alike. It should be put on rather thick and well rubbed out, then there will be no trouble in its running and drying wrinkled, as many say it will if thinned with raw linseed oil alone.

The real reason why many wish to use turpentine or some other volatile oil in the third coat is that then it is not so difficult to apply it; that it will not require so much hard work in the rubbing out, and that it is a saving of time and material to them. This is not denied, but it certainly is not *the best way,* and the advice is given for those who want the best results and who are not afraid of a little extra work in order to obtain them.

## QUESTIONS ON LESSON X

58. General remarks on applying the paint.

59. How is paint applied?

60. What are the best paint pails to do the painting from?

61. What is said about having the paint mixed on the job?

62. What is said in a general way about the thinning of the stock colors?

63. What is said about the thinning of the priming coat?

64. What pigments are recommended as best for priming coat?

65. What is said concerning the addition of volatile oils for the priming coat?

66. What is said about painting of the second coat?

67. How is the paint to be mixed for the second coat?

68. How is the third or finishing coat to be mixed and applied?

## LESSON XI

### THE PAINTING OF WOODEN BUILDINGS

69. In the foregoing chapters the material and appliances used in exterior painting were reviewed and described and the various operations for the mixing of paint were stated as well as general directions given for doing the painting. It is hoped that the student has well mastered it and understands all that was said thoroughly. In order that he may understand all that will be said in the following chapters, it would not be amiss for him to go over the questions and review them in order that he will be doubly sure that he understands them all.

The subject-matter of this lesson is the painting of wooden buildings. This is the most important part of the subject-matter of this manual, as the painting of buildings, on exteriors in America is chiefly

upon structures with a wooden surface, at the present time at least.

It is perfectly safe to state, that four-fifths of all exterior painting is done upon wood surfaces, therefore it is of the greatest importance to consider it first and before the other two which enter chiefly in house construction—iron and brick—as much that is explained here applies also to those.

While the general principles of exterior painting which have been given apply in a way to all kinds of painting done exteriorly, a special application of them is necessary to suit the various surfaces over which paint is applied.

For this reason, therefore, the various peculiarities of wooden, iron and brick surfaces will be considered separately and their individual requirements noted under their several headings.

70. The first step in investigating the needs and requirements for the painting of

wooden buildings will naturally be that of an examination of the condition that they are left in after the carpenters are through with them. The boards, on examination of a powerful eyeglass, will be found full of holes or pits. The naked eye reveals many of these without the use of glasses in many of the woods and are well known to most people under the name of pores. These pores are conduits through which the circulation of sap takes place during the growth of trees, and therefore they honeycomb the whole unseen interior of the woodwork. We all know the effect of moisture upon all vegetation. During the growth of the plant or tree it becomes its life; but after the cutting and the perfect drying of the boards has taken place, then moisture becomes its worst enemy—*when in contact with air.*

71. The oxygen of the air is conducted by moisture into the interior of the wood, and combining with the sap, sets up a fer-

mentation which in time will rot the fibers of the wood and cause its decay. Some woods contain within themselves in their dried sap an anti-ferment principle and that protects them against this element; but unfortunately the woods that must be used in house construction are not of that character, and when left to the action of the elements, they very quickly decay.

This injurious action of moisture is so much feared that architects and carpenters require the painter to be right behind them in order to prime the boards as fast as they nail them on in order that moisture may be kept out of them.

72. This is the one great object why paint is used to cover wooden surfaces. It has already been stated in paragraph 63 that linseed oil penetrates the open pores of wood, sinking in to quite a distance in its interior, forming innumerable rootlets which firmly anchor the paint coatings and fasten them to the wood. When dry the

surface of the wood is thus completely sealed to the influence of moisture, and that is prevented from acting upon the dried-up sap.

73. To understand how this protection is accomplished it will be necessary to know what really takes place during the drying process and what the paint drying really means. Many painters have very confused ideas about it. Some think that drying is by evaporation, which is false; therefore it will be well to study the phenomenon of the drying of the fixed oil in order to understand certain things in painting which otherwise would puzzle a man unnecessarily.

Fixed oils are that class of oils which dry by absorbing oxygen from the atmosphere and forming a new compound with it which becomes hard and rubber-like in consistency and which is waterproof as well.

It was said at the beginning of this paragraph that there is no evaporation in the

drying of fixed oils, or linseed oil, which is the chief one of those oils used in painting —this statement needs qualifying. There is a small loss by evaporation in drying; it is very slight, however, and this loss is more than made up by other gains.

74. It will be an easy matter for any one to test the process of drying so as to satisfy himself of the correctness of the statements made regarding it. A clean piece of glass should be selected and it should be carefully weighed and the weight noted. A coat of raw linseed oil should be spread over the glass and then it should be reweighed, the deduction of the weight of the glass giving the net weight of the oil used.

It was stated that linseed oil dried by absorbing oxygen from the atmosphere and of fixing it by combining with it. This can be ascertained by weighing the glass daily when it will be found that it will gain constantly during some ten days which it takes

to complete the process of drying. The small loss of water by evaporation is more than made up by the absorption of oxygen, and the completely dried oil will be found to have made a clear gain of nearly 8 per cent in its weight.

75. The above test is easily made and convincing, but it teaches us another thing as well, and that is that painting is rushed through entirely too fast. It will be noted that the drying is not completed until the tenth day, so that what, to the touch, may feel and appear as being perfectly dry, is far from being so. To paint over a coat of painting in one or two days after its application, will seal it up against the action of oxygen, or at least greatly delay it, and the further drying must be imperfectly done at the cost of the durability of the painting. For good work then when one is not pushed nor forced to complete a job by a certain time, at least ten or twelve days should elapse before another coat be

applied again. This will give it the full time required for it to dry to the limit. Where dryers are used to hasten the process, it would probably be hastened somewhat, but even then one week should elapse between coats, as the finishing up of the drying is the slowest part of it all.

## QUESTIONS ON LESSON XI

69. General remarks on the painting of wooden buildings.

70. What is the condition of wooden buildings previous to the painting?

71. What action has atmospheric air upon moist wood?

72. In what manner does paint prevent the injurious action of moisture upon wood?

73. How do fixed oils dry?

74. Describe the process of the drying of oils.

75. What else does the test of oil drying teach us?

## LESSON XII

### THE PAINTING OF WOODEN BUILDINGS CONTINUED

76. It is supposed that everything is ready and that some place has been secured in the building to be painted where the stock and tools can be placed and where, if possible, they can be locked up. In the larger buildings some corner in the basement is usually devoted to this purpose, and in the country one can find some outhouse for the purpose where there will be no danger of doing damage by spilling or upsetting paint.

77. The priming is the first operation to be looked after. All the mill work such as door frames, window frames, etc., may have been brought to the paint shop and done there, but is also frequently done right on the job itself and left for some time before they are nailed up to their proper place on the building.

All woodwork should be well brushed over with the dust brush to remove the fine dust made by the sandpapering machines, and any resinous or sappy parts as well as all the knots in the lumber, should be gone over with one good coat; or better, with two coats of orange shellac varnish.

78. It would be better for the job really, not to be in such a hurry about applying the priming coat as it is the practice of doing it. Even a rain will not hurt it any should it come on to the building before the priming is done. It would raise the grain of the wood and it may cause a few checks and the opening up of a few joints in the carpenter's work, but the opening up of the pores means that a greater quantity of linseed oil will enter the wood through them and the checks. Putty will fill up any damage done by the joints opening up, so that, after all, the real damage will be small compared to the better condition that

the wood will be in and to the good that a better coat of priming will do it.

79. The application of the priming coat does not require very great skill, but no one but persons who are conscientious and trustworthy should be allowed to apply it. If slighted or simply brushed over without the conscientious rubbing it in again and again till the wood will absorb no more oil, will not show much worse than the well-done job, but the one will hold up the subsequent coats in good shape for all future painting, while the other will not. The practice of many of using anyone—usually the poorest hands in the shop—is wrong. While it is stated at the beginning of this paragraph that it does not require great skill, the qualifications that were given with the statement must not be lost sight of in detailing the men for the work. A poor painter who is conscientious will do a much better job than one who is much better but unreliable.

80. By referring to paragraph 64 the student will derive some good notions as to what pigments he should use for the preparation of his priming color. By further referring to the red series manual entitled, "Colors," under the heading and description of Ochres, he will find the difference between the various kinds of them and reasons more fully given why one kind is much better adapted for use in priming while the other is utterly unfitted for it.

81. The priming should be perfectly dry before another coat of paint is applied over it, for reasons that were fully given in paragraphs 73, 74 and 75. This will require nine or ten days, when it will be in good condition to receive the second coating. But as it is upon the top of the priming coat that the puttying up of the nail holes, cracks, or open joints must be done in order that the putty may be covered over with two coats of paint so that it will not show through differently from the rest of

the painting, that operation must now be attended to before the second coat is applied.

The practice of many is to have a lump of putty in the hand and to run over the nail holes, cracks, etc., with it, cutting off by simply smoothing them with the hands. It is an imperfect way of doing the work. For good puttying both hands should be used, the left hand holding and forcing the putty down to the bottom of the parts to be filled, while the right hand holding the putty knife cuts it off smoothly and levels it up.

82. It is now ready for the application of the second coat. By referring to paragraphs 66 and 67, the student will see how the stock paint should be thinned and mixed for use.

It will be well to state here that in order to guard against the possibility of missing some portions of the boards in the painting of the last coat on account of their being

of a similar shade, it will be found better to add some pigment to the stock color to darken it up a trifle—just sufficiently that when the third coating is applied, that the one doing the work may be able to see that there have been no holidays left (holiday in painters' vernacular signifies a spot left untouched by paint).

This coat should cover the priming solidly and should be fairly well brushed out and evenly spread—the right way will soon suggest itself to even a novice at the work.

83. A lapse of ten days should be allowed for the proper drying of the third coat and then it will be ready for it, taking care that any dust which may have blown upon the paint before its drying was completed, be sandpapered off and the whole job well dusted from any dry dust having settled upon it.

The stock paint is the color agreed upon for the proper shade of the finished job. It, with the trimmings, especially if light,

should have been put on on the second coat with just enough variation to guard against holidays—this variation should be just a trifle darker in shade, because a slightly lighter shade of a tint will cover more solidly over a darker one than a darker one over a lighter one. The trimmings, when darker than the body color, will usually cover well in one coat. So the second coat can be put on all over the job without any special attention to the trimmings; but if these are lighter than the body color or white, as in many instances, then it will be necessary to go over the trimmings on the second coat also, as otherwise they would not cover perfectly solid in one coat over a dark shade.

The third coat, as it has been already intimated in paragraph 68, should be put on rather thick and should be well brushed out; this will permit its application thinned only with oil, so that it will neither run nor wrinkle up in the drying.

The second coat should have so filled up the pores of the wood that after properly drying there will be no more penetration and should have stopped all suction. The third coat will then dry altogether on the surface and will not need to be thinned with any more oil than will be necessary to insure its spreading properly under the brush.

The job when complete will present a perfect even gloss all over alike and will shed water like a duck's back, forming a waterproof coating and a complete protection to the wood over which the painting has been done. It will, besides, look a thing of beauty and be the joy and pride to the owner and painter alike.

Painting thus becomes not only a matter of prime importance on account of its utility, but also it is a matter of equal importance to most people of taste and means of even more importance, as a beautifier.

## QUESTIONS ON LESSON XII

76. Selection of place for stock and tools on job?

77. How should the woodwork be prepared for the priming?

78. Is it best to commence the priming immediately after the boards have been nailed on to the building?

79. What is said regarding the application of the priming?

80. What is said concerning the pigments to be used in the priming?

81. How and when should the puttying be done?

82. How should the paint be prepared for the painting of the second coat?

83. How should the paint be prepared for the application of the third coating?

## LESSON XIII

### PAINTING WOOD BUILDINGS (CONTINUED)

84. In the two previous chapters the painting of new wood only was considered and in that way and manner which only can make a good substantial first-class job; *i. e.,* by painting new wood with three coats of paint.

Painters are frequently required, however, to paint new buildings in two-coat work only—even by architects who should know better—so the space below will be given to considering "how a passably good looking" job may be made out of it, as when people must have their painting done in that way, the painter must be able to accommodate them or lose their trade.

85. It must be plain to be seen from what has been said heretofore about the principal function of good priming, that if the work is to be finished in two coats, that it cannot be given in the manner recom-

mended for three-coat work. Should it be given with the small proportion of pigment required, then the second or finishing coat cannot possibly cover over it and make a good fair solid covering over it and it would look but little better than second coats do in three-coat jobs.

The priming for two-coat finish must be fully as heavy as second coating should be, as described in former chapters, in order that it may prevent something substantially covered in order to receive the finishing coat.

86. The heavy pigmented priming will be acted upon in the following manner. The pores will absorb the oil until filled up; this will leave the pigment upon the surface with an insufficiency of oil to properly bind it and when dry it will be found very porous and absorbing; this is said in a general way, but more especially of inert pigments. Pigments having an affinity for linseed oil, and which combine with it to

form soaps, will not loose so much of it; but the retention of the linseed oil and the preventing it from freely entering the pores will of itself produce bad priming. White lead is of that character. As it was highly recommended as a priming pigment, the reader may think that a different view of it is here presented, but it is not.

The recommendation of it as a primer was under the condition that only so much of it be used as will show where the priming has been applied, with a very large preponderance of linseed oil over which the small quantity of lead used could not possibly exert any deteriorating influence; but this would not be the same in a heavy lead priming coat. The quantity of oil it would need for thinning would bear no comparison to the other, and this would be no greater than needed for its proper binding, let alone the having to part with any of it to fill the hungry pores, which is the real object of good priming.

87. The priming, then, for this work must be heavy and must not be rubbed out too much in its application, but laid off in a way very similar to second coating.

It goes without the saying that all the preparatory work mentioned to be done prior to priming, as stated in the preceding chapters, must have been attended to before the paint coat is applied, as it is as essential or even more so for this as it is for the other.

88. When dry, which will require the same time as is usual, then the nail holes, cracks and joints should be neatly puttied up, as already described in paragraph 81. The last coat or the second, must be fully as thick as it is usual for third coat, with this difference, that it will be much easier to put on as the priming will not have stopped all the suction and that the pigment is more porous, so that the paint will adhere to it more readily than it would if

the surface was well filled and non-porous or but a trifle so.

Now as to the looks. The priming not having thoroughly filled the wood, the second coat will have to finish that; besides, it will have to divide enough of its own binding oil to supply the porous coating of the priming which will leave it in a somewhat semi-flat condition, which will look fair enough and much more even in appearance than it is usual for ordinary second coat. So that there is a gain in appearance at least. But there is a hereafter coming, when the defective priming and upper coat will surely tell.

## QUESTIONS ON LESSON XIII

84. What is said about painting buildings in two-coat work?

85. Where lays the difference in priming two-coat and three-coat work?

86. What is the result of heavy priming?

87. How should the priming be applied?

88. How should the second coat be put on?

## LESSON XIV

### THE REPAINTING OF WOODEN BUILDINGS

89. Wooden buildings have to be repainted for several reasons, the principal of which are noted below: 1st, Because, unfortunately, while oxygen acted beneficially in the drying of the linseed oil and by its combining with it, it formed an oxylinoate rubber-like waterproof gum, which causes it to become a perfect shield to the deleterious influences of the atmosphere upon wooden surfaces; yet after this beneficial action has been accomplished still further changes take place. Most of them can only be demonstrated by aid of chemistry, nor will they be readily understood without some knowledge of that science.

When reduced to effects, it may be said that after the process of drying is completely finished and even during the process of drying, the oil loses some of its ethers. In their escape, fine pores are produced which will, in course of time, honeycomb the several coatings of paint down into the rootlets formed by the priming, which will form conduits through which moisture, the great enemy of all but few of created things, will slowly find its way to all parts of the paint and gradually but surely sap its life to its foundation, and cause the life of the paint linseed oil to decay. When that is complete, then the pigment either falls off or scales off, according as to the particles composing it have affinity for each other when they scale off or have none, when they chalk off and fall singly.

Therefore, wooden buildings should be repainted more frequently than they usually are. Five years is as long as they

should be allowed to stand without new coatings of paint being given them.

90. This decay of linseed oil, according as it has been going on for a longer or a shorter period, and also as to the character of the pigments that were used in preparing the paint, present various conditions that require different treatment to remedy.

When the previous painting has been well done, at the end of say five or six years, it will still look good, although it will have lost its glossy enameled-like appearance. It is then on the verge of becoming in a much worse condition, and while it does not look bad, it needs renewing. In that condition it will not take much trouble to put it in good trim again for another period of five years, and at a minimum of expense.

If the painting is delayed much longer than that and a further decay of linseed oil occurs so as to have lost its power upon the pigment as a binder, then if the pigment was white lead mainly, it will be

found to chalk badly. This does not require any special preparation for repainting other than dusting and cleaning it off as much as possible, but where the pigments used have an affinity for each other and hold together, as in paint which contains considerable zinc, then they crack and scale. In this condition, it is sometimes necessary to remove the old paint entirely away before repainting; but of this, more will be said further on.

There are a number of intermediate states or conditions in which the old paint may be in according as it may approach the one typical one first described and the last, so that according to that it may be classed as good or poor.

90. There will be no need of saying much about the applying of the paint itself, if the repainting is done when it is first needed other than that it should be thoroughly cleaned before that is commenced.

As the priming is all right and sound there will be no need of any. The chalking of the lead which has just fairly commenced will not have taken much of the material from the building, and it is then in a weakened condition which if prolonged would injure it seriously, but which can be cured and restored to its original state of usefulness by a simple coating of linseed oil with but little more pigment added to it than is usually used in the priming coat. This will allow of the linseed oil penetrating to all the interior parts of the former painting and filling it up, the pigment accompanying helping to seal up the few open pores that might otherwise be left open.

91. When thoroughly dry, a good solid coat of color should be applied, as stated for third coat in paragraph 83, which see. These two coats are all that will be required to make a good job of repainting upon all fairly good surfaces.

92. The cost of doing the work then will be at the minimum. The first coat being nearly all oil, but comparatively little of it will be needed, especially if the first painting was well done. As to the cost of the finishing coat, that, too, will be but slight; so it is a matter of real economy to repaint often.

## QUESTIONS ON LESSON XIV

89. Why should wooden buildings be repainted?

90. What are the conditions that buildings needing paint are usually found in?

91. How should the repainting of the first coat be done?

92. How should the finishing coat be applied?

93. What is said concerning the cost of repainting wooden buildings when first needed?

## LESSON XV

### THE REPAINTING OF POOR SURFACES ON WOODEN BUILDINGS

94. In the preceding lesson the repainting of fairly good-conditioned wood buildings was considered. In this lesson it is purposed to take up the repainting of surfaces which have been let go too long before repainting, or which, from one cause or another, have not a good surface to paint over.

95. There are several reasons why the old paint may be in bad condition. It frequently is caused by bad priming; by the poor quality of the thinner used; by the injudicious selection of material and by waiting too long before repainting, any one of which reasons being sufficient to cause the trouble, but as they usually are combined together in producing the damage, it is not always an easy matter to credit to

each of those agencies for the exact amount of damage due to them.

96. The condition which is the most aggravating is that of scaling. The surface commences to check and crack, then in a little while some of the cracks will part from the wood and after a little longer wait will begin to pull itself entirely off of the surface, falling down by force of its own weight in much the same way that can be noticed on limbs or trunks of sycamore trees.

If they would only take a notion to all peel up and come down at once, it would not be so bad, as then there would be a clear field to recommence the painting upon, but they do not, and there is the trouble; some parts will remain on so tight that it would be a question of many years of waiting for the total scaling to occur, and in the meantime the parts which have scaled off would be an eyesore to every onlooker.

The remedy—and it is the only one—is to take the paint off entirely.

97. There are a number of ways by means of which paint may be removed. The old way of removing it by coating it over with some strong alkaline washes will be remembered by many of the old-time painters, but while it is effective, it is very dirty and requires afterward great care in removing every vestige of it by repeated washings and neutralizing. It has well-nigh become obsolete to-day, and justly so.

98. The many excellent ones manufactured under a certain patent which have no bad effect upon the hands of the one applying them and which can be used much more cleanly, are a very great step forward; and but that their cost is too great for use on such large surfaces as the outside of a house, they would be used more extensively than they are, as in the open air the offensive alcoholic smell which is complained of so much by those having to

use them in interior work is so much reduced by diffusion in the atmosphere that the smell is bearable to most persons.

99. The most common method adopted by painters for removing paint outside is by the use of gasoline torches. These produce an intense heat which, combined with the forceful jet of air, can be guided to any and all parts of the work where needed on the job. The intense heat softens the paint at once, and the painter who guides the burner on the paint with his left hand, follows it up with a wide scraping-knife held in his right hand, removing the paint in ribbon-like flakes the whole width of the weatherboarding at once. It is quickly done. There is but one thing the matter with it, and that is that where the boards have loosened themselves from the building, that possibly some of the lint of the wood inside may become ignited from it and many buildings have been burned down from this cause. If one has a spray pump

and is careful to spray over the parts that have been worked over soon after the removal of the paint and to carry the work on from bottom to top instead of from top to bottom, there need be no danger feared from the burning off of the paint.

100. After the job has been well cleaned up it stands in precisely the same condition as a new building that has never been painted, with the exception that some of the rootlets of the priming may still remain in the wood, and for that reason the priming will not be absorbed as freely as in new wood painting, and therefore more pigment can be added to it. This is all right, as it will not part with so much of its oil in filling the pores. If the job is to be finished in two coats only, the priming may be given somewhat thicker than stated above. It is best, however, not to overdo it, and for best work three coats are recommended.

101. If two coats only are to be given,

the second being the finishing coat, it should be rather thick and thinned with all linseed oil. If it is to be done in three coats, then the second should have a little turpentine added to it and should not be too thick for easy rubbing and laying out.

It is needless to repeat that any puttying needed on the surface of the wood to level it up or to cover any imperfection should be given previous to the application of this coat.

102. In the application of the third coat all that has been said previously in regard to its mixing, thinning, and its application, will apply for this repainting in full.

## QUESTIONS ON LESSON XV

94. What is said about the scope of this lesson?

95. To what agencies is the decay of the old paint due?

96. What is said about paint scaling?

97. How are paint coats removed for repainting?

98. What is said about the patent paint removers?

99. What is said about removing paint by aid of gasoline torches?

100. How should be mixed the priming or first coat for burnt-over work?

101. How should the second coat be applied?

102. What is said regarding the application of the third coat?

## LESSON XVI

### THE PAINTING OF OLD WOODEN BUILDINGS WHICH WERE NEVER PAINTED BEFORE

103. There is just one more condition in which the painting of wooden buildings requires a special treatment differing from all that described under the previous conditions. It is necessary to note the condition of wood that has been left exposed un-

painted for many years. It will be found that moisture will have acted upon the interior of the fibers and partially destroyed the binding that held them together, so that they crumble off in the form of lint, which birds sometimes pull off to line their nests with, and that possibly there may be so much decay that some parts, especially the sappy ones, will be completely rotten.

104. If, from changing of ownership or any other reason, the building is to be painted, it will be an expensive affair to do it in the usual way of priming, second and third coating it with paint.

If done with raw linseed oil, as usual, a brushful of it will cover but little more than the spot where the brush hits the work, and a gallon of priming paint can be applied within a very small space on the weatherboarding. It disappears so rapidly that were it possible to look through the board one would look for it on the other side. It is questionable if it would not

prove more economical to tear the weather-boarding off and put on new, than to attempt to paint it in the ordinary way. Nor does this suction of oil stop at the first coat if the boards are bad—the second coat will also require a much greater quantity of paint than usual. The worst of it all will be that even after the third coat has been put on, while it will be glossy, the surface will be found full of ridges and uneven.

105. It may be well to say that sometimes old houses which have been painted, but from which every vestige of it has long ago disappeared will frequently be found in but little better condition than that mentioned in the preceding paragraph. It therefore stands to reason that such should receive the same kind of treatment as is described in the succeeding paragraphs.

106. What is really needed in order to make these old structures look well and wear well is not an overwhelming drenching with linseed oil, but a good *filling*. This

filling must be able to penetrate to a reasonable distance inside the mass of pores of the wood, but it is not essential that it should do so very much more than the linseed oil priming usually does in the first coating of new lumber. It should be able to level up the ridges formed by the decay of the wood side, to some extent at least, so as to greatly reduce them and this, it was explained, linseed oil *does not* do.

107. To prepare this filler coat which may be called the priming coat, as it is so in reality, requires the use of somewhat different material than that which has been described in the former lessons and a somewhat different treatment of such other material as is mentioned there which is to be used in connection with the new.

Whiting (carbonate of lime) should be used, and a proper working formula is given below and the proper methods of mixing it:

20 lbs. of whiting,

25 lbs. of white lead,
Water,
Milk (sweet) and linseed oil, in suitable quantity, as described below.

Take the whiting, place it in a galvanized pail, pour sufficient water over it to work it up into a thick smooth uniform paste. Let it stand for two or three hours in order that the water may have time to soak up to every portion and particle of it, then add the white lead to the whiting, stirring it up well with it. Let it stand over night, when, next morning, the whole mass will work up smoothly together. Pour in as much sweet milk at a time as will mix with the mass by much stirring, then add about the same quantity of linseed oil as was used of the milk and stir well. This will reduce the thickness of the paint while the milk will thicken it, because it forms an emulsion with the linseed oil. The whiting contains sufficient alkaline matter to saponify

the oil in the lead and all subsequent additions of oil.

The action of the milk is very much the same as that of water, excepting that the casein which it contains is one of the best binding and waterproofing substances known, and many water paints which are patented are composed from it. When added to the filler compound it thickens it by combining with the oil in emulsion. The quantity of pigments mentioned in the foregoing recipe will require the addition of nearly one gallon of sweet milk and of one gallon of linseed oil.

If it is desired to color it with any of the usual colors, take these in the dry state and thin them up with water to a rather thin condition, then pour in the mass into the mother base, stirring it in until thoroughly mixed.

108. To apply it it should have been reduced to a condition of about the same consistency as is usual for second coating

in ordinary work. It should be well brushed in and layed off rather full in order to level up the board as much as possible. It will be found to slide on the boards readily, and the brush will carry enough to make quite a show for the quantity used. The water of its emulsion will prevent the changed condition of the oil penetrating the pores as would be the case otherwise, and when dry the painting presents a much better finish than would have been possible in any other way.

Do not be afraid of it, as it will stand not only as well, but better than if it had been put on with linseed oil only.

109. The second coat may be the same mixture as given for the priming, puttying or any specially bad places should be gone over first before its application, and the spreading of it should be done in the same way as stated in paragraph 108; this will finish up the leveling up of the boards.

When dry, it should be in excellent condition to receive the finishing coat.

110. The finishing, or third coat, must be put on thick and thinned with linseed oil only. It may be mixed from any of the accustomed material mentioned in the painting of new wood, or it may be the thick stock color prepared for the filling—only if that is used, enough of it should have been saved out of the batch before it was thinned out fully. It will then be pretty thick and reduced to a good working consistency with linseed oil only.

## QUESTIONS ON LESSON XVI

103. What is said regarding the painting of old wooden buildings which had never been painted before?

104. Describe the condition such buildings usually present.

105. Do old painted buildings from which the paint has perished for years need a similar treatment?

106. What is said about filling and surfacing such old buildings?

107. How is this filling coat to be prepared?

108. How should the filling coat be applied?

109. How should the second coat be put on?

110. What is said concerning the application of the third coat?

## LESSON XVII

### THE PAINTING OF IRON BUILDINGS

111. The painting of iron surfaces requires a somewhat different system than that described for wooden ones.

Its requirements must be first looked into in order to find the best agents to counteract any evil influences which can be prevented.

Iron, like wood, is full of fine pores, the main difference between them being that

these fine pores are not so continuous as in wood nor nearly so large.

The atmospheric influences which work havoc upon wood are also hard at work in forming new combination with iron or steel. Iron has a great affinity for oxygen, and when aided by moisture, the two readily combine together to form oxide of iron, or *rust*. This action continues until in time the whole of the iron will decompose into such oxide, especially if it is not very thick. This weakens it in a very short time in the case of sheet iron and renders it unfit for use.

112. There is but one remedy, and that is, to cover it over with such substances as will prevent the access of atmospheric air to the iron.

This is the reason why there is so much galvanized iron in the market. It is given a coating of zinc. The zinc has little affinity for oxygen, and if the galvanizing has been properly done, it will effectually pre-

vent the oxygen from the surface of iron.

But this galvanizing process is not always possible, especially for large structural iron. The cost, too, is greater than some of the hereafter described methods are, and which for certain purposes are even better than galvanizing is.

113. The next best thing that may be used to prevent the oxidation of iron is by giving it several coats of paint, as stated for the painting of wood buildings, and for the same reasons. The proper selection of pigments, however, requires some explanation, as some are unfitted for the purpose.

114. The first coat which comes in contact with the iron itself is the only real important one; if that is compounded of the right pigment, the superadded coats may consist of any color desired. All pigments which are the result of the combining of oxygen and other metals and which have the further property of having an affinity

for the iron themselves, or of readily imparting to it of the oxygen they contain, would cause its oxidation instead of becoming a protection against it. So any pigments containing hydrate oxides should be avoided, such as ochres, raw siennas, and even white lead. The oxide of iron paints, not being hydrates, would not be very dangerous, excepting that they, in time, will become more or less hydrated by exposure to the elements, but so slowly as to reduce the danger to a very small degree. It is for this reason that so much of the iron which is painted at the factory receives a coating of such iron oxide paint.

115. Red lead, however, for priming iron is the ideal pigment for the purpose and stands in a class by itself—head and shoulders above all others. But for its greater cost and the greater difficulty of its application, there would not be any other used.

116. As red lead has been so highly rec-

ommended, the student will naturally want to know why it is so much superior and in what this superiority consists. Red lead is the bi-oxide of lead, and, like all oxides of that metal, has the property of saponifying a portion of the oil used in its application with the brush and of hardening in a few days to a metallic solidity. It is for this reason that it is never found ground in oil ready for use as most other dry colors are, as it will settle at the bottom of the can and dry into a hard mass with so much of the oil as it has saponified. After red lead has dried once, although it has emulsated a portion of oil, the soap thus made is *insoluble,* or it would not be so extensively used in jointing up glass in the making of aquariums. This lead soap dries hard and non-porous, and gives a perfectly weatherproof coat to the iron surface over which it is placed. It is not likely to be injured by abrasion as most any other paint would be on account of its metallic

hardness. This alone would suffice to put it at the head of the list; but with its other good qualities added, it must be considered as the king of them all.

117. While red lead up to this point has had only its good qualities brought to view, it must be admitted that like every other good thing there is a dark side to it. Red lead we have seen cannot be ground up in paste form before hand. This, however would not amount to much, but that on account of its heavy weight and comparative coarseness of its atoms, it will settle quickly and when painted out over the iron surface if not put on rather heavy and well brushed out, *it will run.* This, however, would not amount to much, but that having on hand, or on large jobs a power paint mill and running the lead paint thinned for use through it, not more to be ground than will be used during the day. This grinding combines the red lead and linseed oil much better and it helps to sa-

ponify it. Red lead thinned so it could hardly be applied without running before giving it such a grinding, will be found much thicker afterward and much easier to apply —from the saponification received in the grinding.

## QUESTIONS ON LESSON XVII

111. What is said concerning the action of the elements on iron?

112. In what way does galvanization of iron surfaces afford it protection?

113. Can the oxidation of iron be prevented by painting it?

114. What kind of pigments should be avoided in priming iron?

115. What is the best pigment to use in the priming of iron?

116. What is said about the peculiarities of red lead?

117. Can the running of red lead paint be prevented or lessened?

## LESSON XVIII

### THE PAINTING OF IRON SURFACES

118. In the previous lesson it was mainly the consideration of the requirements of iron and steel that were noted and also that of the various pigments useful or otherwise for the preparing of the priming coat of paint. This lesson will treat mainly upon the preparing of the surface of the iron for painting and of the painting proper itself.

119. The preparing of the surface of iron and steel previous to the painting is of as much importance as that of the painting itself is. If it has been well done, a good job of painting can be done over it. If this has been neglected, no matter how good the painting may be that is applied over it—*trouble will surely follow.*

Two enemies of good painting on iron work, must be removed before anything in the way of applying the paint is commenced

on pain of making bad work of it. These enemies are *scales* and *rust.*

120. Scales—these are to be found on all iron work, especially upon rolled iron. Some of these scales are so loose that they can readily be pried off by inserting a chisel under them, others again are pretty hard to remove by hammering them, all such as can be taken off will give way and by proper use of scrapers and wire brushes, can be got rid of. It requires conscientious workmen on such a job as it is an easy matter to slight it.

121. Rust—The one greatest of the two enemies of iron or steel. It must be entirely removed from the surface of the iron to be painted and that is not always very easy to do. But as it is all important that it should be, no pain should be considered too great in order to do so. When it is known that rust produces more rust and that if any be left in ever so little a quantity will soon become a nucleus and center

of propagating activity for the producing of more, no amount of extra work should be thought as thrown away in trying to get rid of it.

There is but one way and that is to rub the surface faithfully with wire brushes until the rust is all removed. Patience, elbow grease and the dust brush will accomplish it if persevered in.

122. When the surface has been well cleaned up the priming should not be delayed a minute longer than necessary, because dampness may set in and cause more rust and more cleaning of it will be necessary before painting again.

It was said that red lead is a difficult paint to apply on account of its heaviness and consequent separating from the oil, so when it is used without grinding it in a paint mill previously, one should keep the paint rather thick in order that it may not run after applying it.

It is customary with many concerns to

add one-fourth part by weight of good English Venetian red to three parts of red lead and of mixing thoroughly together. This of course will make its application very much easier and it may be all right—especially if the Venetian red is a well-made one—but it surely would be all wrong, if it is not.

The application itself requires care as can easily be imagined, for it must be well rubbed out, not merely as well rubbed out as a thick third coat would have to be on a wood building—but more, or it will surely run—if the red lead is used alone.

If ground or rather run through the paint mill just before application, it will be much easier applied and while even then, it will require considerably more rubbing than ordinary paint, it will stand without running much better than without it.

If it has been mixed with the Venetian red as mentioned above, there will be no difficulty.

123. The all important portion of painting lays mainly in the first coating as fully explained above. Iron is not near as absorbent as wood, so that two coats all told including the priming, usually suffice to give a full gloss to the iron surface—especially if the finishing coat is of a dark good covering tone; but if the finish is to be white, it will be necessary to give an extra one or two coats of white over the priming, as it is not possible to give a very good cover in one coat of white over red lead.

There is no special change in the treatment of the superadded coats and the colors should be mixed and applied in the ordinary way which was fully described in the painting of wooden buildings. (See paragraphs 66, 67 and 68.)

## QUESTIONS ON LESSON XVIII

118. Give a synopsis of this lesson.

119. What are the two enemies of good painting on iron work?

120. How are scales removed from iron surfaces?

121. How is rust removed from iron work?

122. How should the priming coat be applied on iron surfaces?

123. How should the subsequent coats of paint be mixed and applied?

## LESSON XIX

### PAINTING GALVANIZED IRON SURFACES

124. It is now the universal practice to do the finishing of store fronts, etc., cornices, etc., in galvanized sheet iron work. At least the cornice work will be of that metal, while the remainder of the building may be wood. There is really no absolute need of paint upon galvanized iron work that has been well done, as that is a much better protection to the iron than paint can possibly be. But for looks such must be painted in order to be in accord with the

rest of the building if it be a wooden one, or to enhance its attractiveness if the whole surface is galvanized iron.

When left in its natural tone there is no great attraction in an unpainted galvanized iron surface, and its look is cheap and unsatisfactory; so paint is usually resorted to to beautify it; also to bring out the details of the work by the use of color.

But there is one trouble with the painting of galvanized iron, which affects all painting done upon it when the galvanized work is first put up—it is very apt to scale off. This is due in part to non-porosity with a greasy surface. This greasiness is not apparent, but is there just the same. Letting the weather have its full effect upon it will in time remove it. Washing it off with dilute muriatic acid (1 part acid to 6 parts water) will also help it—will help to prevent this tendency of the paint parting company with it.

Another reason is that some of the metal-

lic salt pigments form an electrical combination with the zinc of the galvanized coat, and trouble results from this cause, too.

125. Red lead comes in as a cure for all the trouble here as well as for the painting of the pure iron surface as well, so that the remedy can be used in full assurance that it is fully effective. Red lead does not combine with zinc electrically, as white lead will, and priming over any galvanized surface will be the very best treatment that can be given it. All that was said concerning this pigment heretofore will apply with equal force here.

126. It will be necessary if the work has been recently erected to wash it over with the muriatic acid wash described above in order to kill the greasiness mentioned also. The priming will proceed directly, as mentioned in the preceding lesson, and so for the superadded coats also.

127. There are other metals employed in house construction that for beauty sake

are frequently painted such as copper or zinc sheeting. Neither being greatly affected by the elements, the painting cannot be said to be "for their preservation," but as said, to make them look in harmony with their surroundings. Either of these two can be safely primed with red lead only. The student not acquainted with chemistry can make no mistake by confining himself entirely to red lead for the priming of all metallic surfaces. Those who are well versed in that science might possibly devise some priming which would answer the purpose, but they, too, are advised not to experiment on anything valuable. If they confine themselves to red lead exclusively there will be no need of regrets afterward.

## QUESTIONS ON LESSON XVIX

124. What is said regarding the painting of galvanized iron surfaces?

125. What pigment is recommended for the priming of galvanized iron?

126. How should the painting proceed?

127. How should other metallic surfaces (copper and zinc) be treated?

## LESSON XX

### THE PAINTING OF BRICK BUILDINGS

128. All persons are more or less familiar with brick buildings and with their usual conditions. It will be well to study them systematically in order to understand what is required and best fitted to give them the proper treatment for their preservation.

In breaking up a brick there becomes revealed to the naked eye a spongy mass of minute openings permeating the whole interior of its make-up, and extending to the outer surface. These openings during a rainy season absorb moisture readily and conduct it to the interior of the brick work. It is owing to this that so many brick buildings are damp, and that in some sections of

the country the walls sweat so that little rivers can easily be started down the walls by simply running the hand down their sides. This is not so common in the midland section of the United States as it is in the extreme seaboard sections where the amount of rainfall is great and continuous at certain times of the year. But even in the Middle West there is some danger from moisture, especially if the plastering is done directly over the brick without lathing.

While moisture will not affect a well-burned brick, it will eventually cause the decay of the soft ones. Besides this decay, moisture is a good carrier of sulphurous acid which is again eagerly received by the lime, of which the mortar is compounded, forming a new and soluble combination with it which in a few years leaves a mortarless joint and more trouble ahead.

The only assurance a person can have that a brick building will be dry inside, and

that the mortar will remain where it has been placed, is by the "sealing it up," i. e., coating it with something that is waterproof of itself and by properties inherent of itself. It will not be necessary to repeat here what has been fully explained in paragraphs 71 to 75. The action of paint as a preservative, and the manner in which it is done, applies with equal force to the painting of brick buildings.

129. There are some few variations in the methods used for painting brick buildings wherein it differs from that mentioned as used in painting wood, and such will be noted where they occur.

Wood, for instance, parts readily with any surface water it may have absorbed during a rainy spell; but brick does not, especially if there are many soft ones. Even when the outer brick are hard, it is customary to use softer ones inside, and the hard brick will convey moisture to them. It will take two or three weeks of warm

weather after a rainy spell to dry out an ordinary brick building to fit it for the priming coat of paint. For greater safety, the priming of a brick building should be delayed till summer or early autumn, when there is less rain than in the spring.

130. The priming should be just a trifle thicker than described for the priming of wood in paragraphs 77 to 79. It should be well and thoroughly brushed in, and after a few minutes run over again in order to soak up and fill the brick all that can possibly be absorbed.

Hard brick will not absorb the paint as readily as the softer ones, so that it will depend upon their degree of hardness as to the quantity of material that will be needed, some requiring more than twice as much as others,

131. The second coat over brick requires to be mixed a trifle heavier than for woodwork, but sufficiently fluid to soak up any portion that may not have been com-

pletely filled up with oil by the priming. On hard brick there will be but little more absorption, and on such it will be apt to dry with a pretty fair all-over gloss; but on the parts that are rather soft, the gloss will not be uniform. Of course, on soft brick the whole surface will be mostly flat.

132. The third, or finishing coat, should be mixed and put on in exactly the same manner as described for woodwork in paragraph 68.

This on either soft or hard brick will produce a good universal gloss which will shed water and afford a protection to the surface against the possibility of moisture entering it.

## QUESTIONS ON LESSON XX

128. What is said in general about the painting of brick buildings?

129. What condition should the surface of brick buildings be in previous to the painting?

130. How should the priming be mixed and applied?

131. How should the paint be mixed and applied in the second coating?

132. How is the third or finishing coat to be mixed and applied?

## LESSON XXI

### PAINTING BRICK BUILDINGS (FLATTING)

In the preceding lesson, all the painting operations described were done with a view of obtaining a glossy finish; but it frequently happens that such a finish is not desired on account of the glare which will bring out all the roughness on the face of the brick. On the contrary, if the paint finishing coat is done *flat* the defects become nearly invisible, and the general outlook of the surface of the building acquires the appearance of pressed brick—at a distance at least.

134. This flatting of the paint requires a special treatment and different handling

of the painting as well as a different mixing of the paint itself; as this flatting is not done in the same way as it is usually done in interior flatting, for the very good reason that if it was mixed in the same way, it would soon be washed off by rains, as there would be no binding to hold it on.

135. In order that flatting will hold on to exposed exterior painting, it must be well bound on to the surface; that is self-evident. But linseed oil used in even moderate quantities, let alone a sufficient quantity of it to make a good binder for the paint, would not produce a good flat and at best but a semi-flat, so some other thinner must be used in order to produce the *dead flat* required for the imitation of pressed brick so much admired. The color itself should be ground in some good japan —this will partially help to hold it on— and while it is not nearly so good as linseed oil for an exposed condition when applied, as will be described in succeeding

paragraphs, the flatting will hold firmly and stand good for years.

Nearly every color-grinder prepares variously colored reds and yellows to imitate the many different tones of brick, and no one should undertake to make or prepare his own from dry colors, for failure will be pretty sure to follow.

136. The priming and second coat should be given in the usual way, as described in paragraphs 130 and 131.

The third coat, too, should be put on in the usual way. It is all important, however, that it be thinned with all raw linseed oil without dryers of any kind being added to it. The reason for this is that the drying may proceed as slowly as possible, and that after the painting has commenced to set, that it may hold a tack as long as possible.

137. The painting of the flat coat requires more care in its application than the other coats, because the endings must be

squared up to the mortar joint and must not extend beyond on the adjoining brick because by the time the next stretch is applied it would have set and there would be a doubling up of the paint, which would show glossy.

The paint, as taken out of the cans, must be thinned with turpentine only.

Now in order to do a good job of flatting *that will hold* instead of waiting till the third coat has dried hard, as it has universally been recommended before, the flat coat must be applied to it just as soon as it has set and while it is yet tacky. If done in that way the flat coat will be held on by the third coat, and really, it will become a part of third coat itself.

This is the only *sure way* of binding it on so that it will hold.

## QUESTIONS ON LESSON XXI

133. What is said concerning the flatting of brick buildings?

134. Is the flatting on brick surfaces done in the usual manner?

135. How should the pigments be ground for brick flatting?

136. How should the priming, second and third coat be put on for flatting?

137. How should the flat coat be applied?

## LESSON XXII

### REPAINTING BRICK WORK AND PENCILING

138. The repainting of brick buildings does not differ in any respect from that of any other repainting already explained. It will depend upon the good or bad condition of the old paint itself as to whether it needs to be burned off or not. Usually, it is not necessary unless the old paint is scaling off badly or when there has been a great number of coats of paint put on for years, as it would be unsafe to add still more on to the already too numerous number on it. There is always great danger of

blistering after a dozen or more coats, and it is always best to burn it off in order to get a good foundation for a new clean job of painting.

The painting or burning off of the old paint and of painting of the job afterward should proceed in exactly the same manner as described in the preceding lesson.

139. Lining or striping of the mortar line is often resorted to in order to give the job a more natural appearance. When it is well done it certainly looks well; but it must be well done. If the mortar line is lined out straight there will be no trouble. If the mortar line is wavy, crooked and uneven, it will be better not to do that kind of work at all, as the straightening out of the lines would have to be done upon the face of the brick, which would make it look miserably poor. It is much better to leave it in its solid color, which will at least not call the attention of the beholder to the defects of the brick laying.

140. The color for the striping should be mixed rather short in order that a good clean edged line can be carried out. By *short,* is meant a word used by sign painters to denote a paint which, in addition to linseed oil, has had a small quantity of petroleum oil added to it. This gives it the property of not spreading as much as it would without it and consequently of cutting clean-cut edges.

The lining itself is not very difficult; yet the man with the know how can do so much more of it with ease to himself than the novice can that it will look miraculous to him; nothing but time and practice will give one the proper speed. Fig. 14 illustrates the form of the tool used in the lining of the mortar. It is used in connection with a straight-edge.

## QUESTIONS ON LESSON XXII

138. How is the repainting of brick walls to be done and prepared for?

239. What is said about the lining or striping of the mortar line?

240. How is the mortar line striped?

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